EVALUATING THE IMPACT OF ENHANCING INFORMATION AND COMMUNICATION TECHNOLOGY IN A RURAL, COMMUNITY-MODEL PRIMARY HEALTH CARE SETTING IN NEWFOUNDLAND AND LABRADOR

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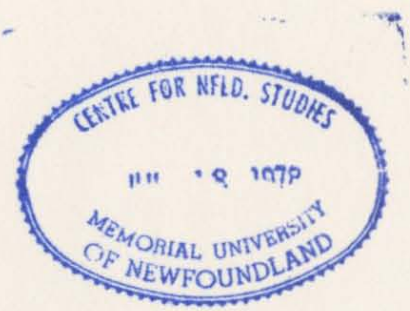
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EVALUATING THE IMPACT OF ENHANCING INFORMATION AND COMMUNICATION TECHNOLOGY IN A RURAL, COMMUNITY-MODEL PRIMARY HEALTH CARE SETTING IN NEWFOUNDLAND AND LABRADOR

By

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DEDICATION

To my husband Dion

and everyone else who exercised patience with me

as I worked through this.

ABSTRACT

The Connaigre Peninsula primary health care (PHC) setting was chosen by the Newfoundland and Labrador government to explore the value of sharing client information in an interdisciplinary environment, by building on existing technologies to fill gaps in information and communication capabilities. A series of technical enhancements were implemented in this setting over approximately one year. The purpose of this study was to evaluate the impact of these technical enhancements. Key stakeholders were engaged in the development of an evaluation framework and later evaluation protocol that was used to guide the evaluation.

Using a comparative case study design, two additional PHC sites with varying levels of technical capacity were included as comparison sites in the evaluation: Bonne Bay, which had minimal technical capacity, and Twillingate/New World Island, which had a high level of technical capacity.

Primary data collection included a survey and focus group with PHC team members and interviews with key stakeholders. Secondary data collection included use of data collected at the same sites as part of another study (Team Effectiveness/Scope of Practice Survey and Client Satisfaction Survey) and a review of existing documents.

Findings indicate that the enhancement of information and communication technology (ICT) can facilitate various aspects of PHC delivery including team functioning, quality of care and administrative functioning. Findings and lessons learned can be used to support the enhancement of ICT in other community-model PHC settings, as well as facilitate the advancement of a province-wide electronic health record (EHR).

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LIST OF ACRONYMS

AHRQ	Agency for Healthcare Research and Quality
BB	Bonne Bay
BSC	balanced score card
CHSRF	Canadian Health Services Research Foundation
CLSC	centre local de services communautaires (local community service centre)
COMPETE	computerization of medical practices for the enhancement of therapeutic effectiveness
CP	Connaigre Peninsula
CPOE	computerized provider order entry
CPR	computerized patient record
CRMS	Client and Referral Management System
CT	computed tomography
DI	diagnostic imaging
EDI	electronic data interchange
EFMI	European Federation for Medical Informatics
EHR	electronic health record
EICP	Enhancing Interdisciplinary Collaboration in Primary Health Care
EMR	electronic medical record
EPR	electronic patient record
ER	emergency room
ERDIP	Electronic Record Development and Implementation Programme
GP	general practitioner
HbA1c	haemoglobin A1C
HIC	Human Investigation Committee
HMO	health maintenance organization
HTF	health transition fund
ICT	information and communication technology
iEHR	interoperable electronic health record
IOM	Institute of Medicine
IMPROVE-IT	Indices to Measure Performance Relating Outcomes, Values and Experience from Information Technology
IM&T	information management and technology

IS	information system
IT	information technology
LAN	local area network
LDL	low density lipoprotein
LMR	longitudinal medical record
LOI	letter of intent
LPN	licensed practical nurse
MCP	medical care plan
MDS	minimum data set
NHS	National Health Service
NLCHI	Newfoundland and Labrador Centre for Health Information
OPHC	Office of Primary Health Care
OR	odds ratio
PACS	Picture Archiving and Communications System
PCI	Patient Care Inquiry
PDA	personal digital assistant
POC	point of care
PHC	primary health care
PHCEP	Primary Health Care Enhancement Project
PHCTF	Primary Health Care Transition Fund
PM	practice management
PROBE	Project Review and Objective Evaluation for electronic patient and health records projects
RCT	randomized controlled trial
RFP	request for proposals
RHA	regional health authority
RN	registered nurse
ROI	return on investment
TETRA	Telehealth and Educational Technology Resource Agency
T/NWI	Twillingate/New World Island
VP	vice president
VPN	virtual private network
WHO	World Health Organization

1. INTRODUCTION

1.1 Background

Primary health care represents the base of the health care pyramid and is critical to the provision of high quality care (Starfield, 1991 & 1994; Institute of Medicine, 1994). It is highly dependent on information, as it requires coordinated efforts across sectors and levels of care (Starfield, 1994; Barrett & Turner, 2006), and has been described as "information (or data) intensive" (Bates, Ebell, Gotlieb, Zapp & Mullins, 2003; Scott, 2007).

One of the most significant challenges in health care, particularly primary health care, is the ability to effectively manage information (Lappas, 2002). Traditional medical record systems are no longer optimal for serving the roles for which they were intended and are hindering quality and efficiency of health care (Tang, Fafchamps & Shortliffe, 1994). Disadvantages of paper-based records include availability to only one person at a time, poor legibility, inability to be accessed remotely or at the time and place where needed, difficulty to search and fragmentation with multiple volumes and storage sites (Bates et al., 2003; Feied et al., 2004; Hippisley-Cox et al., 2003; Sujansky, 1998; Bishop, 1991 as cited in Kalra, 1998). In their landmark article, "A proposal for electronic medical records in U.S. Primary Care", Bates and colleagues assert that, using paper-based systems, "the unaided human mind simply cannot process the current volume of data required for practice, especially given the broad scope of primary care" (Bates et al., 2003). Paper-based record systems, memory-based medicine and telephone-based coordination of care are becoming increasingly unreliable and are not well-suited

to good quality care, especially for persons with multiple chronic conditions (Burton, Anderson & Kues, 2004).

In recent years, computerized or electronic records, particularly the electronic health record (EHR), have been advocated as a method of storing, accessing and sharing information concerning health and health care. An EHR is a lifetime record of an individual's health history and care within a health care system. The record would be available electronically to authorized health care providers and the individual anywhere, anytime, in support of high quality care (Alvarez, 2007; Burns, 2007). Even in the absence of a full EHR, computerization or automation of certain types of information can facilitate some aspects of care (Starfield, 1998). A 2003 policy synthesis on primary health care, commissioned by the Canadian Health Services Research Foundation, suggested that the absence of suitable information technologies is a major constraint to achieving important primary health care objectives and recommended that "integrated information systems be promoted and funded that are capable of accommodating complete clinical data and of serving various groups of professionals delivering services" (Lamarche et al., 2003).

A national survey of Primary Health Care strategies and activities within Regional Health Authorities (RHAs) reported that more than one third of RHAs had undertaken health information and communication technology (ICT) initiatives as part of their primary health care renewal strategies and others were planning such investments (Kouri & Winquist, 2004). However, many provinces in Canada have indicated that the

introduction of such technologies into the primary health care setting is a challenge (Wilson, Shortt & Dorland, 2004).

The challenges associated with the introduction of ICT notwithstanding, the literature suggests that enhancing information and communication systems capacity can have a positive impact in the primary health care setting. Soper (2002), for example, reported that an electronic medical recod (EMR) improved patient care and reduced physician stress. Garrison, Bernard and Rasmussen (2002) found patients' perceptions of computer use by family physicians to have a positive effect on the physician-patient relationship as well as on the overall quality of care during the visit. In an earlier study, clinical and support staff working in community-based primary health care practices reported that the electronic medical record (EMR) had changed how they managed patient records, communicated with each other, provided patient care services and performed their jobs (Wager, Lee, White, Ward & Ornstein, 2000). Although the full range of benefits will not become clear until more systems are implemented and evaluated, there is growing evidence that ICT has the potential to improve both quality and efficiency in the primary health care setting (Claflin, 2000; Bates et al., 2003; Bodenheimer & Grumbach, 2003).

1.2 Rationale

There is a dearth of evaluation studies that examine the impact of new health information and communication technologies in primary health care settings. Many studies to date have focused on practice-specific EMR systems in physician offices rather

than on functionality enabled through the introduction of various health infomation technologies in multidisciplinary, team-based primary health care practices. Further, as many studies are pre-/post-implementation studies carried out in a single setting, one can not be certain that improvements in care delivery are due to the implementation of new health information and communication technologies as this would require comparision of settings with and without such technologies (Gill, Ewen &Nsereko, 2001).

An important part of the primary health care (PHC) framework in Newfoundland and Labrador is the improvement of information and communication technologies (Government of Newfoundland and Labrador, 2003). Following a comprehensive assessment of the information needs and state of readiness at seven Primary Health Care sites across Newfoundland and Labrador, the provincial government selected one rural (Connaigre Peninsula) and one urban (St. John's) setting to explore the value of sharing client information in an interdisciplinary environment, through the enhancement of information and communication capabilities (Newfoundland and Labrador Centre for Health Information, 2004).

The approach to the enhancement of information and communication capabilities differed considerably between the two settings. In the rural setting, the approach was to fill gaps in the current information and communication capabilities by building on existing information and communication technologies wherever possible. In the urban setting, a common practice management/electronic medical record (PM/EMR) was implemented to support all required functions in a user friendly, efficient manner that will be compatible with the vision of the provincial electronic health record (EHR).

This study assessed the impact of enhancing information and communication technology (ICT) in the Connaigre Peninsula (rural) primary health care setting. The results of the study help fill an important gap in the literature related to the impact of introducing information and communication technologies in a rural, community-based primary health care setting. Findings of the evaluation may also be used by the provincial government, as well as by other Canadian jurisdictions, to help inform the decision to enhance information and communication technologies in other community-model primary health care settings.

1.3 Objectives

The objectives of the study were as follows:

1) to describe three primary health care sites in Newfoundland and Labrador in terms of their: (a) setting; (b) health services delivered; and (c) technical environment;
2) to describe the enhancement of ICT in one of the three sites (i.e. Connaigre Peninsula);
3) to develop, in consultation with key stakeholders, an evaluation framework to examine the impact of enhancing technical capacity in primary health care; and
4) to use the evaluation framework to examine the impact of enhancing technical capacity in a rural primary health care setting (i.e. Connaigre Peninsula) on perceived team functioning, health care delivery and other areas, as identified in the evaluation framework.

2. LITERATURE REVIEW: PRIMARY HEALTH CARE AND INFORMATION AND COMMUNICATION TECHNOLOGY

2.1 Primary Health Care

"Primary health care" (PHC) has many definitions. It has been characterized in terms of a level of care, a set of services, a means of organizing care within the health system and an overall approach to providing health care. A number of key features have been identified that are essential to the attainment of effective primary health care. While its meaning is often a source of confusion, it is widely recognized as the cornerstone of health care and has been the major focus of health system reform in recent years.

2.1.1 Defining Primary Health Care

The terms primary care and primary health care are often used interchangeably. Primary health care became a core policy for the World Health Organization (WHO) with the Declaration of Alma Alta (1978) which defines primary health care as "essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country can afford. . . It is the first level of contact of individuals, the family and community with the national health system, bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care process". Primary care has been defined by the United States Institute of Medicine (IOM) as "the provision of integrated, accessible health care services by clinicians who are accountable for addressing a large majority of personal health care needs, developing a sustained

partnership with patients, and practicing in the context of family and community" (Institute of Medicine, 1994). The Canadian Medical Association regards primary care as the entry point to the health care system and inter-related to the other components of the system. It defines primary care as first contact assessment of a patient and the provision of continuing care including the management of health problems, prevention and health promotion and ongoing support, with family and community intervention where needed (Starfield, 1998) . More recently, Health Canada has defined primary health care as "an approach to health and a spectrum of services beyond the traditional health care system. It includes all services that play a part in health, such as income, housing, education, and environment". It distinguishes primary care as "the element within primary health care that focuses on health care services, including health promotion, illness and injury prevention, and the diagnosis and treatment of illness and injury" (Health Canada, 2004). While each of these definitions share some common characteristics, in general, definitions of primary care tend to focus on the provision of medical care; definitions of primary health care includes medical care but also acknowledge the broader determinants of health.

As a level of care, primary care is the entry point into a health system that also includes higher levels of care – secondary, tertiary and quaternary care. Secondary care is consultative in nature, usually for the purpose of helping primary care providers with diagnosis and management of patients with specific disorders. It is first level specialized care requiring more complex diagnostic procedures and treatment than in primary care. Tertiary care is care for individuals with uncommon and complex conditions that require

highly specialized treatment. Tertiary care generally involves intensive hospital-based care. Quaternary care is an extension of tertiary care and refers to the provision of highly complex sub-specialty services. White (1973 as cited in Starfield 1998) distinguishes primary, secondary and tertiary care based on the nature of the health problems addressed, site of care, referral patterns, duration of responsibility, information sources used, use of technology, interest in the care process and focus of training (Table 1).

Table 1. Characteristics of Levels of Care

CHARACTERISTIC	PRIMARY	SECONDARY	TERTIARY
Health problem	Common and non-specific	Infrequent and more specific	Rare and complicated
Site of care	Community setting	Inpatient: general care	Inpatient: intensive care
Referral pattern	Direct access	Some direct access and some referral	Referral practice
Extent of responsibility	Continuing care	Intermittent care	Some episodic care and some continuing care
Information service/source	Patient and family Epidemiological database	Epidemiological database and to lesser extent patient/family and biomedical database	Biomedical database
Use of technology	Regular laboratory	Regular laboratory and to some extent complex equipment and staff	Complex equipment and staff
Orientation/interest in care process	Largely prevention/health maintenance as well as early diagnosis/ disability containment and to a lesser extent rehabilitation/ palliation	Largely early diagnosis/disability containment	Palliation /rehabilitation
Training need	Broad and general	Concentrated	Narrow and highly specific

White (1973)

As a means of organizing health care, primary care clinicians, particularly physicians, may be seen as "gatekeepers" to other sectors and levels of care (Starfield, 1998). As gatekeepers, primary care clinicians decide what diagnostic tests will be performed, if referrals will be made to other providers and what course the care will take. In essence, Health Canada's definition of primary health care supports this gatekeeping function, however regards it more as a facilitating or coordinating role (Health Canada, 2004), rather than true gatekeeping.

Varying definitions and meanings aside, primary health care is generally accepted in the current Canadian context as an integrated approach to the provision of basic, everyday health care by a range of health care professionals that incorporates both the medical and non-medical determinants of health and acknowledges the importance of healthy individuals and communities. In recent years, we have seen a shift from the medical model of care that focuses on illness and episodic care within the health system, to a multi-disciplinary, integrated approach that is increasingly being seen as a more effective way of delivering care within and outside the health system.

2.1.2 Features of Primary Health Care

While largely implicit in the various definitions of primary care and primary health care, Starfield (1992) explicitly identifies four essential elements that are essential in primary care: 1) first-contact care, 2) longitudinality, 3) comprehensiveness, and 4) coordination. This also holds true for the broader concept of primary health care. These

elements tend to overlap and are closely linked to other important aspects of primary health care.

"First-contact" implies the entry point into the health care system. In order to be an entry point, first-contact care must be accessible, not only from the point of view of the facility that provides it, but it should also be perceived as accessible by potential users of the services (Starfield, 1998). First-contact care with a primary health care provider may result in direct treatment of a condition or it may lead to referral to other primary health care providers or to other levels of care. In Canada, a key feature of primary health care is interdisciplinary primary health care teams that work together to provide a broad range of services (Health Canada, 2004; Nolte & Tremblay, 2005; National Primary Health Care Awareness Strategy, 2006). As such, first contact with the health care system may be through a physician or non-physician provider from various disciplines.

Starfield (1998) defines "longitudinality" as a long-term personal relationship between practitioners and patients. The achievement of longitudinality requires the existence of a regular source of care and its use over time. Inherent to longitudinality is the provision of care that is person-focused rather than disease-focused. Studies have shown benefits of longitudinality, either with an individual or a place as a regular source of care, such as better preventative care (Flach et al., 2004; Xu, 2002), better recognition of previously identified conditions, therapies and tests (Starfield, Simborg, Horn & Yourtee, 1976), reduced hospital admissions (Gill & Mainous, 1998) and lower health care costs (Maeseneer, Prins, Gosset & Heyerick, 2003).

A term related to longitudinality, in the context of primary health care, is continuity. A number of aspects or dimensions of continuity have been identified in the literature, however the term "continuity of care" often lacks clear definition (Reid, Haggerty & McKendry, 2002). A recent multidisciplinary review of academic and policy literature organized these dimensions into three types of continuity: informational continuity, management continuity and relational continuity (Reid et al., 2002; Haggerty et al., 2003). Informational continuity is the use of information on a patient's past events and circumstances in providing current care. Information is critical to linking health care events and is particularly important in primary health care which serves a coordinating role within the health system. Management continuity refers to the provision of patient care by multiple providers in a complementary manner. This type of continuity is important in the management of complex diseases by multiple providers. Relational continuity refers to an ongoing relationship between a patient and a provider. It is this type or dimension of continuity that is most closely related to Starfield's "longitudinality" (Starfield, 1998).

The third element, "comprehensiveness", refers to the role of primary care in arranging all types of health care (Starfield, 1998). This includes services with different primary health care providers as well as referrals to secondary and tertiary care services and community services, such as home care. In primary health care, the range of services offered must be based on need (Starfield, 1998; Health Canada, 2004; Government of Newfoundland and Labrador, 2003) and is often influenced by available resources (Starfield, 1998; Government of Newfoundland and Labrador, 2003). It is therefore

difficult to define an all-encompassing, comprehensive set of primary health care services, as the range of services offered in any one area may be different from that in another. Starfield (1998) suggests that primary health care services should consist of a core set of first-contact services that is relevant to every population as well as additional services based on community needs. As such, primary health care services offered in many areas include health promotion, disease and injury prevention and treatment, chronic disease management, mental health and maternal health (Health Canada, 2004; Government of Newfoundland and Labrador, 2003; Starfield, 1998).

An aspect of primary health care that is related to comprehensiveness is the primary health care team. As discussed, interdisciplinary primary health care providers that work together to provide a comprehensive range of first-contact services is a key element of primary health care (Health Canada, 2004; National Primary Health Care Awareness Strategy, 2006; Nolte & Tremblay, 2005; Gill and Mainous,1998). The World Health Organization defines a primary health care team as "a group of persons who share a common health goal and common health objectives determined by community needs, to which achievement of each member of the team contributes, in co-coordinated manner, in accordance with his/her competence and skills and respecting the functions of others" (World Health Organization, 1985 as cited in Nowjack-Raymer, 1995). Similar to the range of services provided, the primary health care team must reflect the needs of the population as well as resources available to the community.

"Teams" is also one of the four key pillars, or elements, of primary health care identified in the National Primary Health Care Awareness Strategy, launched in 2005 by

Health Canada and Saskatchewan Health. The strategy aimed to provide Canadians with a better understanding of primary health care by focusing on four key elements: 1) primary health care providers working as *teams*, 2) improved *information* sharing, 3) *access* to the right services and 4) *healthy living*. In addition to primary health care providers, the strategy recognizes communities and individuals as team members and equal partners in the health care decision-making process (National Primary Health Care Awareness Strategy, 2006).

The fourth element of primary care, as identified by Starfield (1992), is "coordination". Coordination has been described as a hallmark (Starfield et al., 1976) and, along with continuity, a core building block (Romanow, 2002) of primary health care. The coordination function of primary health care is important as patients often do not know what services they require. Further, fragmentation of services can lead to unnecessary costs, for example due to repeated, unnecessary diagnostic tests (Romanow, 2002). Coordination ensures that patients receive the services they need and that they are connected across services and settings (Institute of Medicine, 1994). This might include other primary health care services, other levels of care, or other care settings such as community or home care. Starfield (1998) notes that coordination requires some form of continuity, either by health care providers, medical records or both. In primary health care, providers working together in teams and sharing information between providers and levels of care can facilitate coordination of care.

2.1.3 Models of Primary Health Care

As responsiveness to community needs is a key element of primary health care (Starfield, 1998; Government of Newfoundland and Labrador, 2003; Health Canada, 2004), it is not unexpected that the range and organization of primary health care services would vary from one area to another. Recognizing this, funding through the provincial/territorial envelope of the Primary Health Care Transition Fund (PHCTF) required only that jurisdictions focus on one or more of five common objectives of the PHCTF (Health Canada, 2007b). As such, various models of primary health care organization exist within Canada.

In a Canadian Health Services Research Foundation (CHSRF) policy synthesis (Lamarche et al., 2003), models of primary health care organization within industrialized countries, including Canada, were organized according to their vision of primary health care: the "professional" vision and the "community-oriented" vision. In addition, models were compared according to six broad effects primary health care should produce, including effectiveness, productivity, accessibility, continuity, quality and responsiveness.

Professional models of primary health care deliver medical services, largely by physicians and sometimes nurses, to clients who seek out these services or register with a primary health care organization. There are two professional models of primary health care: the professional contact model and the professional coordination model. The professional contact model is the most common primary health care model in Canada and generally involves physicians working in private or group practice and paid on a fee-for-

service basis. In the professional coordination model, a client generally registers with a primary health care organization, which is integrated and coordinates services with other components of the health system (Lamarche et al., 2003). Health Maintenance Organizations (HMO's) in the United States are an example of the professional coordination model of primary health care. In Canada, this model of primary health care is virtually non-existent.

Community-oriented models of primary health care aim to improve the health of a defined geographical area through the provision of a range of health, social and community services. Community-oriented models of primary health care are usually associated with a local or regional health authority and include health care providers from various disciplines who work together to provide a range of services. Two community-oriented models exist: the integrated community model and the non-integrated community model. The major defining characteristic of the two community-oriented models is their degree of integration with other aspects of the health care system, where the non-integrated model provides the same services as the integrated model but has no specific mechanisms to ensure integration with other aspects of the health system (Lamarche et al., 2003). An example of the community-oriented model of primary health care are the local community health centres (CLSCs) in Quebec, which resemble the integrated model in rural areas and the non-integrated model in urban areas.

In Newfoundland and Labrador, the primary health care framework, *Moving Forward Together*, sets out essential features of primary health care renewal, but allows for flexibility in its implementation to respond to the unique circumstances of different

areas of the province. The professional contact model continues to be the dominant primary health care model in urban areas of the province, with some practices sharing characteristics with the professional coordination model. In rural areas of the province, the integrated community-oriented model is common. Given the challenges of limited resources and a geographically dispersed population, working together in interdisciplinary teams has been a familiar approach in many rural areas of the province. However, funding made available though the PHCTF provided necessary structures and helped formalize primary health care.

A review of primary health care models in Canada and other industrialized countries concluded that no single primary health care model produced all the desired effects of primary health care (Lamarche et al., 2003). The integrated community model, such as those in rural areas of Quebec and Newfoundland and Labrador, provides the most benefit in terms of effectiveness, productivity, quality and continuity. The professional co-ordination model also provides important benefits, including greater accessibility and responsiveness to clients needs. It has been recommended that the integrated community model be used as a benchmark for primary health care reform in Canada, while taking measures to address the identified shortcomings, including accessibility and responsiveness to patients (Lamarche et al., 2003).

2.1.4 Primary Health Care Reform

Since the mid 1990s, there has been a general consensus that there is a need to reorganize primary health care in an effort to improve the health of Canadians and sustain

our health care system. Reform efforts come in light of escalating health care costs, largely as a result of an aging population, rising rates of chronic disease and obesity and growing shortages of health care professionals (Health Canada, 2007b). In 1997, the federal government established the Health Transition Fund (HTF) to support evidence-based decision making in health care reform. Between 1997 and 2001, the HTF funded a number of primary health care pilot projects across Canada, including 3 projects in rural Newfoundland and Labrador (Mable &Marriott, 2002). In 2000, First Ministers agreed that "improvements to primary health care are crucial to the renewal of health services" (Treasury Board of Canada Secretariat, 2003), with reinforcement from the 2002 Romanow Commission. "There is almost universal agreement that primary health care offers tremendous potential benefits to Canadians and to the health care system…no other initiative holds as much potential for improving health and sustaining our health care system" (Romanow, 2002).

In 2003, First Ministers committed to a Health Care Accord (Health Canada, 2006a) which set a target of having 50% of Canadians having 24/7 access to a primary health care provider by 2011, which was reiterated in the 2004 Ten-year Plan to Strengthen Health Care (Health Canada, 2006b).

In response to the 2000 meeting of First Ministers, and in consideration of the recommendations from the primary health care pilot projects across Canada, the federal government established the Primary Health Care Transition Fund (PHCTF). Between 2000 and 2006, the PHCTF supported provinces and territories to reform their primary health care system by providing transition costs associated with introducing new

approaches to primary health care delivery. Under this initiative, there were five funding envelopes including: 1) a provincial/territorial envelope which directly supported provinces and territories in primary health care reform activities; 2) a multi-jurisdictional envelope that encouraged collaboration among jurisdictions on primary health care initiatives; 3) a national envelope that supported primary health care initiatives of national significance; 4) an Aboriginal envelope to improve the quality of services to Aboriginal peoples; and 5) an official languages minority communities envelope which responded to the unique needs of French and English speaking minority communities in Canada (Health Canada, 2007b). Newfoundland and Labrador's share of this funding under the provincial/territorial envelope was $9.7 million.

In September 2003, the Government of Newfoundland and Labrador, Department of Health and Community Services, released *Moving Forward Together: Mobilizing Primary Health Care*, a provincial framework for primary health care. The framework built on *Healthier Together*, the Province's strategic health plan, that positioned primary health care as the central focus for the delivery of health and community services and outlined a plan to reform the health system. It also reflected the national vision of primary health care, incorporated recommendations from the provincial Primary Care Advisory Committee and stakeholder consultations, and encompassed lessons learned from the 1997 Primary Health Care Enhancement Project (PHCEP).

The PHCEP, funded in part through the Health Transition Fund (HTF), was implemented between 1997 and 2001 in three rural sites (Twillingate, Port aux Basques and Happy Valley-Goose Bay), each with its own approach to reorganizing primary

health care based on varying local needs and opportunities. A key finding from the Newfoundland and Labrador pilot was that improved access to information (e.g. through internet access, email, access to information resources, software to support practice and videoconferencing equipment), is a useful tool in primary health care, supporting professional development and service delivery. It was also concluded that improved access to information in primary health care needs more emphasis (Government of Newfoundland and Labrador, 2001).

The provincial primary health care framework (Government of Newfoundland and Labrador, 2003) outlines an incremental approach to primary health care reform in Newfoundland and Labrador that builds on existing strengths and opportunities in local areas and allows for flexibility in implementation, while retaining core features across team areas. Among the core features of the framework are primary health care teams and physician networks providing interdisciplinary services; primary health care networks providing services on a consulting basis; distribution of workload and maximum scope of practice for team members; appropriate emergency transportation providing uninterrupted care between primary health care and secondary and tertiary care; a population base of sufficient size to support a broad range of services and registration of clients with a primary health care team; advisory committees to help identify community needs and facilitate intersectoral involvement; a focus on health promotion and wellness, based on needs assessments within the community; and ICT supports to ensure effective and efficient delivery of services.

A provincial Office of Primary Health Care (OPHC) and Primary Health Care Advisory Council were established to provide policy direction, overall implementation and evaluation direction and funding to primary health care teams, through the Primary Health Care Transition Fund (PHCTF), until March 31, 2006. Primary health care teams were implemented based on the submission of a letter of intent (LOI), followed by full proposals, to the OPHC. Between April 2004 and March 2006, eight primary health care teams were implemented in Newfoundland and Labrador including seven rural teams in Twillingate/New World Island, Bonne Bay, Connaigre Peninsula, Bonavista, Placentia, Labrador East and Grenfell, and one urban team in St. John's. Post March 31, 2006, some additional funding was made available for additional primary health care teams, including Deer Lake/White Bay. However, the provincial OPHC concluded its mandate with the conclusion of support though the PHCTF in September 2006.

2.1.5 Benefits of Effective Primary Health Care

Evidence of the contribution of primary health care to the overall health of a population is accumulating. At the broadest level, international comparisons of the four main characteristics of primary care (i.e. first-contact, longitudinality, comprehensiveness and coordination), as well as additional characteristics, show that industrialized countries with a stronger primary health care orientation generally have healthier populations (as assessed by common indicators such as life-expectancy, low birth weight and mortality rates) and have lower health care expenditures. These studies also identify policy characteristics that may be important to establishing strong primary health care, such as

comprehensiveness, family orientation and universal financial coverage (Starfield, 1991; Starfield & Shi, 2002; Mackino, Starfield & Shi, 2003).

Research has also consistently shown a relationship between more primary care providers, generally primary care physicians, and improved health outcomes for indicators such as mortality, infant mortality, life-expectancy and self-rated health (Shi, 1992, 1994 & 1999, Vogel &Ackermann, 1998). Studies that have examined the impact of receiving care from a primary care provider rather than another health care provider have shown similar benefits (Franks & Fiscella, 1998; Roos, 1979; Villalbi, Guarga, Pasarin et al., 1999 as cited in Starfield et al., 2005; Waitzkin, Wald, Kee, Danielson & Robinson, 1997; Regan, Schempf, Yoon & Politzer, 2003). A greater supply of primary care providers (Franks & Fiscella, 1998; Baicker &Chandra, 2004), as well as care by primary care physicians in comparison to care by specialists for common conditions (Rosser,1996; Whittle et al., 1998), has also been shown to be associated with lower health care costs, with no differences in outcomes.

In Canada, recent primary health care reform efforts have been accompanied by a major focus on evaluation and numerous studies have been undertaken or are currently underway (Haggerty & Crossling, 2005). A CHSRF review and synthesis of primary health care evaluation studies concluded that there is evidence that collaborative models of primary health care have positive outcomes for patients, providers and the system, such as enhanced patient satisfaction and better health outcomes; enhanced provider satisfaction, knowledge and skills; and more effective resource utilization (Barrett, Curran, Glynn & Godwin, 2007).

2.2 Health Information and Communication Technology

Along with increasing emphasis on health system reform, the need for enhanced information and communication technology (ICT) to improve safety, efficiency, continuity and quality of care has been championed in numerous health system reviews over the past decade. Information and communication technologies in health care take many forms including phone systems, email, electronic health records (EHRs), electronic medical records (EMRs), telehealth services, registries and other technologies to record, process and transfer information. With proper information management structures in place, there are significant benefits expected for individuals, health care providers and the system as a whole. Despite the attention and championship it has received, adoption of health ICT has been slow, especially in primary health care.

2.2.1 Support for Health Information and Communication Technology

In the 2000 Communiqué on Health, First Ministers committed to the development of electronic health records and the enhancement of communication systems such as telehealth technologies (Treasury Board of Canada Secretariat, 2003). Following the Communiqué, Canada Health Infoway (Infoway), an independent, not-for-profit organization whose members are Canada's federal, provincial and territorial Deputy Ministers of Health, was established to accelerate the use of electronic health information systems and electronic health records (EHRs) across the country. Around the same time, two Federal inquiries, the Romanow Commission (2002) and the Kirby Commission (2003), highlighted the importance of improving health information systems. In the 2003

Health Accord (Health Canada, 2006a), and the later 10-Year Plan to Strengthen Health Care (Health Canada, 2006b), First Ministers again recognized that electronic health records and telehealth technologies are key to health system renewal and reinforced their commitment to accelerate the development and implementation of electronic health records, by continuing their work with Infoway.

Infoway defines an electronic health record (EHR) as "a secure and private lifetime record of an individual's health and care history, available electronically to authorized health care providers" (Alvarez, 2007; Burns, 2007). While systems vary across Canadian jurisdictions and among countries, patient registries, diagnostic imaging systems, pharmacy information systems and laboratory information systems are widely recognized as essential building blocks of an EHR and progress has been made across Canada toward the implementation of the core components of an EHR (Neville et al., 2004; Canada Health Infoway, 2008).

Unlike the EHR which is patient-centered, the electronic medical record (EMR), sometimes called the electronic patient record (EPR) or computerized patient record (CPR), is provider-centered. It is analogous to a physician's (or other provider's) paper-based medical record in which he or she records and collects information that is specific to his or her role in the patient's care at the point of service (Barrett & Turner, 2006; College of Family Physicians of Canada, 2007). EMRs are practice-specific and may also include features related to decision support, administration and practice management. Ideally, EHRs and EMRs should be interfaced to allow integration of services and facilitate communication across interdisciplinary teams (Barrett & Turner, 2006; College

of Family Physicians of Canada, 2007). While EMRs were not previously part of Infoway's investment strategy, the 2009 Federal budget provided Infoway with $500 million to further support EHR development, as well as to speed up the implementation of EMR systems for physicians.

2.2.2 Benefits of Information and Communication Technology in Health Care

As a result of a shift from paper-based records to electronic records and information management tools, major improvements are expected to the overall quality of the health care system and the delivery of patient care. Romanow (2002) identified the advantages of an EHR to include improved diagnosis and treatment as a result of improved access to complete personal health information by health care providers; improved accuracy of personal health records as information from a variety of health care providers is collected and stored in a single record; improved efficiency as less time will be spent managing paper records; improved patient safety through an enhanced ability to identify and respond to medical errors or problems that occur in the health care system; improved security by implementing safeguards and bringing together health records that were previously physically dispersed into a new comprehensive format; and improved opportunities for surveillance and research. Kirby (2003) also noted the potential for improved quality, safety, accessibility, timeliness and efficiency of services by integrating various components of the health care system that currently work in silos. "*In the absence of a common EHR, both privacy and health care are substantially at risk from the wide dispersal of fragments of a patient's record here and there*" (Kirby, 2003).

Other potential advantages include more timely access to care by reducing wait times and transferring information across large distances; improved efficiency by reducing duplication of tests and multiple copies of paper records; and improved information sharing and support for team-based care (Health Council of Canada, 2005 & 2006).

Even in the absence of an EHR or EMR, computerization can still facilitate some aspects of the care process (Starfield, 1998). For example, registries have been used to implement guideline-based care for chronic disease management in family practice. Registries can track the number of patient contacts, screening or diagnostic tests completed, results and other parameters of interest, such as HbA1c values in diabetes management (Barrett & Turner, 2006). Electronic reminder and warning systems and decision support tools are also among information management tools being used by physicians within Canada. Electronic appointment scheduling systems, internet and email for communicating with other providers and patients, as well as electronic access to journals and clinical practice guidelines, are also being used in both the hospital and clinic setting (College of Family Physicians of Canada, Canadian Medical Association and Royal College of Physicians and Surgeons of Canada, 2004). Such computer-based tools can allow providers to collaborate more easily (Health Canada, 2007c), access the latest information, select the best course of action, and use evidence to guide their decisions (Romanow, 2002).

Telehealth technologies also have potential for improving health service delivery. Telehealth has been defined as "the use of communication and information technologies to deliver health services, expertise and information over distance, geographic, time,

social and cultural barriers"(Reid, 1996). It is supported by a range of technologies that foster information sharing including telephone-based services, videoconferencing, store and forward software, peripheral devices such as electronic stethoscopes, home care technology and mobile point of care devices such as palm pilots (Barrett & Turner, 2006). Telehealth is a vital health care support for remote locations. It can provide a more equitable level of PHC services between sparsely populated and geographically separated areas, reduce travel time and therefore lower costs for patients and health providers, provide better educational opportunities for health providers who may not otherwise have access to such programs, support inter-professional development and enable contact between primary health care providers and referral services (Health Canada, 2007a; Barrett & Turner, 2006).

As coordination is an essential element of primary health care (Starfield, 1992), information sharing is particularly important in the primary health care context and has been identified as a "key pillar" of primary health care (National Primary Health Care Awareness Strategy, 2006). As PHC teams work together, there is a need to share information among team members and across levels of care. Health information and communication technologies create opportunities to improve communication among team members and provide support for clinical and educational activities (Barrett & Turner, 2006). The Enhancing Interdisciplinary Collaboration in Primary Health Care (EICP) initiative, funded by Health Canada under the PHCTF, presents a framework with seven key elements that are required to sustain interdisciplinary collaboration in PHC. One of the seven key elements is information and communication technology (ICT). ECIP

maintains that: (a) information and communications technologies create critical information pathways that are essential to improving continuity of care and service delivery; and (b) continuity of information correlates with improved quality of care, administrative processes and patient safety (Nolte & Tremblay, 2005).

2.2.3 Monitoring Progress of Information and Communication Technology

The Health Council of Canada, established under the 2003 First Ministers' Accord on Health Care Renewal, is mandated to monitor and report on the progress of health care renewal in Canada. Each year, the Health Council publishes a report outlining progress made on the First Ministers' commitments on health care renewal, including their commitment to enhance information and communication technologies.

In their 2005 report, the Health Council of Canada noted that many of the health care reforms committed to by First Ministers depend on rapid exchange of patient information among health care providers working in different locations (Health Council of Canada, 2005). "*If we don't modernize the management of patient information, all other activities for health care renewal will stall*" (Health Council of Canada, 2006). While there has been progress towards this end, particularly through the work of Infoway, the Council noted that progress has been slow and recommended that health care providers, government and the public commit to rapid adoption of electronic health record and telehealth tools (Health Council of Canada, 2005). In the 2006 report, the Council reinforced its message and recommended that electronic drug information systems, with e-prescribing capabilities, should be linked with electronic health records

(Health Council of Canada, 2006). In a recent synthesis of PHCTF initiatives results, it was also recognized that there is much work yet to be done, especially if we are to ensure that the "information highway" reaches the environments where primary health care teams work, whether in offices, clinics or communities (Health Canada, 2007a).

The Health Council identified several issues regarding implementation of electronic health records that need to be addressed if we are to move to a paperless health care system. These include issues related to funding, privacy and confidentiality, the integration of information from different sources, education and training, and the willingness of providers to adopt new technology (Health Council of Canada, 2005 & 2006). Other barriers that have been identified include the lack of standards (Starfield, 1998; Barrett & Turner, 2006) and the transition time required to move from paper files to electronic files (Barrett & Turner, 2006). To help overcome some of these barriers, a number of toolkits have been developed, such as the College of Family Physicians Primary Care Toolkit (College of Family Physicians of Canada, 2007) and Health Canada's EMR Toolkit (Health Canada, 2007c), to help providers with the implementation of information technology solutions.

2.2.4 Progress in Canada and Newfoundland and Labrador

Implementation of the core components of the electronic health record, as well as the implementation of health information and communications technologies in primary health care settings, is occurring to varying degrees across Canada (Health Canada, 2007; Burns, 2007; Canada Health Infoway, 2008). In a review of EHR initiatives in Canada

completed in 2004, it was found that there was little uniformity in the design and planned implementation of the core components of an EHR and each jurisdiction has a different configuration of legacy systems upon which it is building its EHR (Neville et al., 2004). As of December 31, 2008, Infoway had approved funding for a total of 276 projects, with each province/territory involved in two or more projects (Canada Health Infoway, 2008). Nine jurisdictions (Alberta, Prince Edward Island, Northwest Territories, British Columbia, Quebec, Ontario, Newfoundland and Labrador, Manitoba and Saskatchewan) are expected to have a complete EHR infostructure in place by 2010 or shortly thereafter. Further, most jurisdictions have some work underway related to the implementation of EMRs and other information technologies in primary health care settings. This consists largely of ad hoc implementation of EMR solutions at individual practices or pilot projects that will inform a more coordinated provincial effort in the future (Chernos, 2007).

There has also been growth in telehealth activities over the past few years. As of December 31, 2008, Infoway was engaged in telehealth projects in 11 jurisdictions, as well as several national projects (Canada Health Infoway, 2008). Alberta has a very well-developed provincial telehealth network and one of the largest telehealth networks in North America (Health Canada, 2007).

In Newfoundland and Labrador, the Newfoundland and Labrador Centre for Health Information (the Centre) has a mandate to develop a confidential and secure province-wide electronic health record. To realize this mandate, the Centre is responsible for coordinating the development of the primary components of the provincial EHR.

These components include registries (client registry and provider registry), a drug information system, a diagnostic imaging system, a laboratory information system, telehealth and Electronic Medical Records (EMRs). The Centre is also responsible for coordinating provincial participation in national standard setting activities for the EHR, focusing on messaging and terminology standards as well as communication protocols.

The Newfoundland and Labrador Client Registry holds the demographic and administrative information related to individuals who receive health and community services in Newfoundland and Labrador or who are registered with the provincial Medical Care Plan (MCP). Since 2000, the Client Registry has been used by staff of hospitals, community services offices, long-term care facilities and MCP to accurately identify individuals. The Client Registry shares information with the provincial Picture Archiving and Communication System (PACS) and has been recently upgraded to facilitate its integration with the Pharmacy Network.

The Diagnostic Imaging/Picture Archiving and Communications System (DI/PACS) initiative supports the move from film ("hard copy") to "film-less" (electronic or soft copy) imaging. As of October 1, 2007, all health regions were included in the provincial PACS database. Health providers in Newfoundland and Labrador are now able to electronically collect, store, manage, distribute and view patient radiology reports and images entirely in digital format.

The Pharmacy Network is the Newfoundland and Labrador drug information system. The Pharmacy Network will create online, real-time patient medication profiles for individuals living in the province. It will hold comprehensive drug information and an

interactive database that will assist health providers in identifying potential adverse drug interactions and events. Using the Pharmacy Network, health providers will have access to complete patient-specific drug profiles at the point of distribution and physicians will be able to enter and transmit medication orders online. The construction of the Pharmacy Network is complete and testing of the system is underway. Deployment of the Pharmacy Network began late 2009.

To support the implementation of the provincial EHR, a Provider Registry project is also underway that has started with the integration of the six regulatory bodies whose professionals prescribe, dispense or view medication profiles. The Provider Registry went live with the implementation of the Pharmacy Network.

In addition, planning for the establishment of a provincial laboratory system is complete as part of the Interoperable Electronic Health Records and Laboratory Information System (iEHR/Labs) initiative, which also includes the integration of all components of the provincial EHR. The province is well situated for a provincial laboratory system, which will allow clinicians to view laboratory results regardless of where they are located or where the test was conducted, as regional laboratory information systems are already in place and some providers already access electronic laboratory results and other patient data through the regional systems. The iEHR/Labs project was officially announced in April 2009.

As part of its work to develop a province-wide EHR, the province is also incorporating telehealth solutions. Newfoundland and Labrador has a long history of telehealth, with many research and development projects taking place through TETRA

(Telehealth and Educational Technology Resource Agency) at Memorial University of Newfoundland. Although much infrastructure has been put in place to support telehealth through these projects, only some regions continued on with the provision of telehealth services past the project stage. In order to have telehealth become a sustainable program, a Provincial Telehealth Strategy was developed in 2005. It identified five strategic directions: selfcare/telecare, access to specialists and specialty services, chronic disease management, tele-homecare, and point of care learning. Two initiatives were approved for implementation: the HealthLine, a 24 hour health advice and information service, managed by the Department of Health and Community Services (which falls under the selfcare/telecare strategy) and the telehealth chronic disease management plan. The focus of the chronic disease management initiative is on the use of videoconferencing to enhance current care delivery to patients with chronic diseases, allowing them to receive care, services, and support closer to home. Between July 2006 and October 2008, telehealth services were used in more than 22,000 patient visits and physician case reviews through the telehealth chronic disease management program, reaching patients in 42 rural communities (Newfoundland and Labrador Centre for Health Information, 2008).

The use of Electronic Medical Records (EMRs) is also essential in the development of a provincial EHR in Newfoundland and Labrador and EMRs will supplement the information available through the EHR. Approximately 5% of the provinces physicians have EMRs in their clinics (Newfoundland and Labrador Centre for Health Information, 2008). As previously discussed, the provincial government, in

collaboration with the Newfoundland and Labrador Centre for Health Information (NLCHI), selected two primary health care settings, one urban and one rural, to explore the value of sharing client information in an interdisciplinary environment through the enhancement of information and communication technologies, as part of its primary health care reform efforts. In the urban setting, a common practice management/electronic medical record (PM/EMR) solution was implemented in four primary health care clinics to support all required functionality. The approach in the rural setting was to fill the gaps in their current information and communication capabilities by building on existing information and communication technologies within their community health centre and satellite clinics. As such, the rural setting received a series of technological enhancements to augment their existing information and communication capabilities over an approximately twelve month period.

2.2.5 Description of the Rural Information and Communication Technology Enhancement Project

As noted above, the approach to the enhancement of information and communication technology (ICT) in the rural primary health care setting was to fill gaps in their current information and communication capabilities by building on existing technologies. The enhancement to information and communications technology was the result of the following multi-step process.

- An assessment of the information needs and state of readiness at seven Primary Health Care sites across Newfoundland and Labrador was carried out by the

Newfoundland and Labrador Centre for Health Information (NLCHI), with the intent of selecting two sites for the enhancement of ICT. This included site visits and face-to-face interviews with primary health care team coordinators and members and other individuals involved in the delivery and support of key technical systems.

- Based on the findings of the needs assessment, the Connaigre Peninsula primary health care setting, a rural site, was selected by the provincial Office of Primary Health Care, in collaboration with NLCHI, as one of the primary health care sites to receive ICT enhancements.

- Following the needs assessment and selection of the Connaigre Peninsula primary health care site for the enhancement of ICT, a consulting company, Sierra Systems Group Inc., was engaged to assist in defining information management requirements. It was expected that the defined requirements would be used in the development of a tender for an information management solution.

- Information management requirements were defined by Sierra Systems Group Inc. following: 1) a review of existing materials including information collected during the needs assessment; 2) business process workshops with interdisciplinary representatives, followed by confirmation/prioritization workshops to define requirements pertaining to key business processes; 3) interviews with individuals involved in the delivery and support of key technical systems such as Meditech

and CRMS; and 4) an informal market scan.

- A report was developed by Sierra Systems Group Inc. and NLCHI, titled *Electronic Health Record (EHR) for Primary Health Care (HC) Requirements Report*. This report outlined the functional and non-functional requirements and presented a fit gap matrix that maps the data requirements against key existing systems (e.g. Meditech). Functional requirements refer to capabilities or operations a system user performs in support of their business processes (e.g. client search). Non-functional requirements refer to general system capabilities or architectures. Functional requirements were assigned a priority of mandatory (i.e. required to meet client needs), desirable (i.e. contributes to system effectiveness and efficiency) or helpful (i.e. reasonably efficient workarounds exist). Presented in Appendix A is the list of functional requirements along with priority ranking.

- As it was determined through the above process that many of the requirements and priority data elements for the Connaigre Peninsula primary health care setting were available through existing source systems, a decision was made to leverage existing systems, along with the implementation of some additional pieces of technology, rather than implement a packaged electronic medical record (EMR) solution. This differed from the solution identified to meet the requirements of the urban site. For the urban site, a request for proposals (RFP) was developed and issued for a full vendor EMR solution.

- A funding proposal was developed by the Connaigre Peninsula Community Health Centre, in collaboration with the two health boards that supported the area, that built on the work carried out by NLCHI and Sierra Systems Group Inc., which outlined a proposed solution based on the identified requirements.

- The funding proposal was approved as submitted by NLCHI and the provincial Office of Primary Health Care. Using a phased approach, implementation of the proposed solution began in March 2005. All components were scheduled to be complete by the end of December 2005.

- As of March 31, 2006, some of the items outlined in the funding proposal remained outstanding. At that time, a decision was made to study the technical environment at each study site as it existed as of March 31, 2006 (in order to meet the timelines and provide preliminary findings from the study at the conclusion of the formal provincial primary health care renewal initiative in September 2006).

2.3 Evaluating Health Information and Communication Technology Initiatives

Evaluation involves judging the value or merit of something by collecting information or evidence in a systematic way and making comparisons (Ovretveit, 2002; Weiss, 1972). Evaluation research is different from pure research in that it is intended to inform decision making, as well as contribute to new scientific knowledge (Ovretveit, 2002; Weiss, 1972). In the health care setting, evaluation research is important in determining the effectiveness, or conditions necessary for maximum effectiveness, of

newly implemented programs, policies or interventions (Ovretveit and Gustafson, 2002). The use of action evaluation, whereby the evaluator works with the user to clarify the criteria to be used to judge the value of an intervention, is particularly important in health care, as many programs and policies change over time (Ovretveit, 2002).

Similar to other areas of health care, methods and approaches to the evaluation of information and communication technology (ICT) initiatives in health care have received increasing attention in recent years. While there is no evaluation framework that has been universally accepted and used, several evaluation frameworks have been identified in the published and grey literature that draw on an overlapping body of literature and, therefore, share many characteristics and can be complementary. Some evaluation frameworks present a conceptual model for the evaluation of health ICT initiatives and present specific dimensions and measurement indicators that should be included in the evaluation. Others are intended to be a step by step process to guide the evaluator through the evaluation process from the earliest stages of idea conceptualization through dissemination of study findings.

A search of the literature reveals that few studies reference any evaluation framework and most focus on a single aspect of a more comprehensive evaluation, such as provider satisfaction. Following is a summary of some of the models and frameworks that have been used in previous evaluations or proposed for future evaluations of health ICT initiatives, as well as a review of relevant evaluation studies of health information and communication technologies in primary health care.

Authors note: Portions of section 2.3.1 were derived from the report *Towards an Evaluation Framework for Electronic Health Records Initiatives: A Proposal for an Evaluation Framework (Neville et al., 2004)* for which the researcher was a co-author.

2.3.1 Approaches to Evaluating Health Information and Communication Technology Initiatives

DeLone and McLean (1992) proposed a framework for characterizing and measuring the success of information systems (IS), which includes 6 major dimensions: 1) system quality, 2) information quality, 3) use, 4) user satisfaction, 5) individual impact, and 6) organizational impact. Examples of system quality measures are response time, ease of use, system reliability and system accessibility. Information quality measures, which are often addressed from the perspective of the user and therefore subjective in nature, include information accuracy, timeliness, completeness, reliability and relevance. Measures of information use can be obtained through self-report or audit logs, and include use by whom, frequency of use and extent of use. Measures of user satisfaction are the most widely utilized indicators of system success, primarily because of their inherent face validity, and the availability of reliable measurement instruments, such as satisfaction questionnaires. Individual impact measures are strongly tied to measures of performance, such as quality of decision making, change in decision behaviour, efficiency of task accomplishment, time to decision making and confidence in decision making. Studies of this success indicator are most often undertaken in laboratory settings using computer simulations. Measures of organizational impact have been derived primarily from the business sector and include cost reduction, cost effectiveness,

contribution to profitability and return on investment (ROI). The authors suggest that there are many success measures which fall into the 6 dimensions described above and emphasize the importance of studying the interrelationships among these dimensions. In a ten-year follow-up article, DeLone and McLean (2003) provided an overview of how the model has been validated and offer suggestions for updating the model including: (1) adding "service quality" as a new dimension, and (2) collapsing "individual impact" and "organizational impact" into a broader category of "net benefits". The DeLone and McLean model of IS success is probably the most widely recognized framework for the evaluation of information systems projects.

Kaplan (1997 & 1998) proposed a social interactionist framework for the evaluation of health information systems initiatives. The social interactionist framework considers the relationship between system characteristics, individual characteristics and organizational characteristics. The framework is informed by theoretical models of organizational change, user reactions to health information systems and the diffusion of innovation theory (Rogers, 1993). The framework suggests focusing on the 4Cs of evaluation: 1) communication (the ways that departments linked by computers interact with each other), 2) care (effects on the delivery of medical care), 3) control (impact on control within the organization), and 4) context (extent to which impact of medical information systems depends on the practice setting). Kaplan further suggested five methodological guidelines that can be useful when developing a comprehensive evaluation plan. These include: 1) focus on a variety of technical, economic and organizational concerns; 2) use multiple methods including measurement, experimental

techniques and observational approaches; 3) be modifiable and adapt to changing circumstances; 4) be longitudinal, with data collection occurring at multiple time points and 5) be formative as well as summative, providing regular feedback to relevant individuals (Kaplan, 1995 & 1997).

IMPROVE-IT (Indices to Measure Performance Relating Outcomes, Value and Experience from Information Technology) is a large-scale research initiative that is attempting to assess whether increased Information Technology (IT) capabilities, availability and use lead to improved clinical quality, safety and effectiveness in a hospital setting (Leonard & Sittig, 2007). An early step in this process was the development of a set of measurement indicators in three main areas: 1) costs, including initial and on-going investment; 2) infusion, including system availability, adoption, and deployment; and, 3) health outcomes, including clinical efficacy, efficiency, quality and effectiveness. While IMPROVE-IT focuses on assessing the benefits of information and communication technologies in an inpatient hospital setting, indicator areas and some of the measurement indices can be adapted for the evaluation of information systems projects in other settings.

Lau (1999) proposed an action research framework to guide information systems studies as a means to "bridge theory with practice, allowing one to solve real-world problems while contributing to the generation of new knowledge". There are four dimensions to the framework: (1) the conceptual foundation; (2) the study design to describe the methodology; (3) the research process of diagnosis, actions, reflections and general lessons; and (4) the respective roles of the researcher and participants. The

framework highlights the importance of engaging participants in the research and that the role of the participants should be effective in helping solve the problem and extract learning from the experience. The intent of the framework is twofold: 1) to provide a set of criteria and questions that should be taken into account when designing, conducting and publishing an information systems evaluation study, and 2) to serve as a comprehensive checklist to critically assess the quality of information systems action research studies.

Protti (2002) outlines the various approaches to evaluation and maintains that traditional methods of evaluating information management and technology (IM&T) tend to take either an organizational or socio-technical viewpoint as to whether the information system is deemed successful and that the selection of success measures depends on the viewpoint taken. He further maintains that infrastructure investments cannot be justified on a return on investment basis. Following an invitation to aid in the development of an evaluation methodology for the National Health Services (NHS) information strategy, Protti proposed a newer approach to evaluation, the balanced score card (BSC), and presents a step by step process for using a balanced score card for the evaluation of IM&T. The balanced score card (BSC) is a means to evaluate corporate performance by keeping score of a set of items that maintain a balance between short- and long-term objectives, financial and non-financial measures, lagging and leading indicators, and internal and external performance perspectives, and is a valuable tool that allows managers to see the positive and negative impacts of IM&T on factors that are important to the health system as a whole (Protti, 2002).

In addition to some of the frameworks already discussed, several evaluation frameworks have built on or expanded prior evaluation models, particularly the DeLone and McLean model of IS success (e.g. Hebert, 2001; Turunen, 2003; Neville et al., 2004; Yusof, Papazafeiropoulou, Paul & Stergioulas, 2007; Lau, Hagens & Mutitt, 2007). Hebert (2001), for example, proposed a telehealth evaluation framework that builds on Donabedian's model for assessing quality of care as well as the DeLone and the McLean model of IS success. Donabedian's model (Donabedian, 1980) includes three elements: 1) structure, 2) process and 3) outcome, with quality of care as the dependant variable. Hebert (2001) recognized an overlap between Donabedian's model and the DeLone and McLean model where Donabedian's "structure" element is equivalent to DeLone and MaLan's dimensions of information quality and system quality, "process" is equivalent to system use and user satisfaction, and "outcome "is equivalent to individual and organizational impact. Herbert (2001) expands Donabedian's quality of care model by borrowing from DeLone and McLean's dimensions of individual and organizational impact and separating the structure element into individual structure and organizational structure. In a review of evaluation models for medical information systems, Turunen (2003) asserted that Hebert's (2001) framework is the first model to capture the nature and understanding of telehealth in telehealth evaluation.

In addition to facilitating the development and implementation of health information and communication technologies as previously discussed, a key business strategy of Canada Health Infoway (Infoway) is measurement and benefits evaluation. As such, Infoway developed a benefits evaluation framework to guide field evaluations

of information systems initiatives that they have invested in within provinces and territories (Canada Health Infoway, 2006; Lau et al., 2007). Infoway's framework also builds on the IS success model by DeLone and McLean (2003) and presents a set of measures for each of the six dimensions of the IS success model (i.e. system quality, information quality, service quality, use, user satisfaction and net benefits) that will allow them to evaluate the impact of their investments in terms of health care quality, productivity and access. Measures that were considered most significant, practical and measurable were included in the framework (Lau et al., 2007).

Similar to the evaluation efforts of Infoway in Canada, the UK Institute of Health Information produced a set of documents for the National Health Service (NHS) Information Authority to guide the evaluation of electronic patient records (EPRs) and electronic health records (EHRs) in England and Wales. The first (NHS Information Authority, 2001a) is a reference source of methodologies developed through a review of evaluation methods that have been applied to health care IT applications, EPRs and EHRs. A companion report, PROBE (Project review and objective evaluation for electronic patient and health records projects), provides practical guidance for those undertaking an evaluation of EPR and EHR projects. Six steps are presented to guide the planning of an evaluation: 1) agree why an evaluation is needed; 2) agree when to evaluate; 3) agree what to evaluate; 4) agree how to evaluate; 5) analyze and report, and; 6) assess recommendations and agree on actions (NHS Information Authority, 2001b). The document outlines an evaluation framework that addresses the three elements of Donabedian's model (Donabedian, 1980) for assessing quality of care (structure, process

and outcomes) along five dimensions: strategy, operational, human, financial and technical. Evaluation designs, methods and tools are briefly described with reference to the earlier document (NHS Information Authority, 2001a), along with an explanation of how they might be appropriately used. Key principles of evaluation are emphasized including the need for formative and summative elements, advanced planning, close integration to the project lifecycle, clearly defined aims and objectives, the inclusion of a before and after element and the collection of both quantitative and qualitative data.

The U.S. Agency for Healthcare Research and Quality (AHRQ), National Resource Center for Health Information Technology, has also developed an Evaluation Toolkit that serves as a guide for project teams who are developing evaluation plans for health information technology projects (Cusack & Poon, 2007a). The toolkit is presented as a workbook and takes the evaluation team through the process of determining the goals of the project, what is important to the stakeholders, what needs to be measured to satisfy the stakeholders, what is feasible to measure and how to measure it. The AHRQ National Resource Center has also created a version of the toolkit that is targeted specifically towards health data exchange projects. The Health Information Exchange Evaluation Toolkit (Cusack & Poon, 2007b) is similar in format to the Health Information Technology Evaluation Toolkit and offers suggestions and examples for evaluating the exchange of health information between various stakeholders (e.g., health care providers, health departments, pharmacies and laboratories). In addition to a set of steps to follow in the development of an evaluation plan, each toolkit includes a list of possible measures to

include in the evaluation, suggested data sources, cost considerations and potential pitfalls, as well as example evaluation plans developed using the toolkit.

While not an evaluation framework per se, the European Federation for Medical Informatics (EFMI) recently released a working draft of their Guidelines for Best Practices in Health Informatics (Nykanen, Brender, Ammenwerth &Talmon, 2007). Recognizing that there is not a single global approach or methodology that is valid in all evaluation studies or any context, a working group was established by EFMI to develop a paper that would provide best evaluation practice guidelines for health informatics, based on experiences by key players in the evaluation literature in health informatics. The document presents a set of issues that are relevant for designing and implementing an evaluation study in the health informatics domain. The guidelines address all phases of the evaluation including study exploration, first study design, operationalization of methods, detailed study design and study implementation. Issues related to project management, risk management and publication are also addressed. The authors recommend adhering to the guidelines so that the general validity and generalizability will be increased, since a number of omissions, pitfalls and dangers will be avoided.

One of the more comprehensive approaches to the evaluation of health information systems initiatives identified to date is *Towards an evaluation framework for electronic health records initiatives: A proposal for an evaluation framework* by Neville et al. (2004). It is a template for the design and conduct of evaluation studies to assess health information systems initiatives and was informed by: a) a review of electronic health record (EHR) related initiatives across Canada; b) the research team's personal

involvement with EHR initiatives in Newfoundland and Labrador; c) a systematic review of relevant literature; and d) feedback from key informants on earlier drafts of the framework. Following a synopsis of the literature related to the most common perspectives on evaluation models and frameworks that have been used to guide previous evaluation efforts or proposed for future evaluation projects (many of which have been presented above), key recommendations or messages that emerged from the literature were presented. Taken from Neville et al. (2004), these include:

- A planned evaluation, introduced at the initial project stages, can help overcome many obstacles (Heathfield et al., 1999).

- It is important to develop a process for engaging stakeholders, particularly physicians, in establishing principles and premises for large IS projects (Protti, 2002).

- Evaluation frameworks should: (1) focus on a variety of technical, economic and organizational concerns; (2) use multiple methods; (3) be modifiable; (4) be longitudinal; and (5) be formative and summative (Kaplan, 1997).

- Many formal evaluations of major health information technology investments in the public sector have focused on critiques of implementation rather than assessment of health care benefits. The time has come to attempt to quantify benefits not just in organizational, business or financial terms, but also with respect to health outcomes and the intermediary variables which lead to improved

health outcomes in the health care delivery system, including improved diagnosis, more effective treatment, more focus on prevention, less errors and more evidence-based decision making (Donaldson, 1996).

- Evaluation is not just for accountability, but also for development and knowledge building. Future evaluations should be multi-perspective, multi-method, include qualitative methods and involve diversely constituted research teams (Heathfield, Pitty & Hanka, 1998).

- Limitations of Randomized Controlled Trials (RCTs) for the evaluation of complex health information systems initiatives include: (1) low power/not enough observations (Burkle, Ammenwerth, Prokosch & Dudeck, 2001); (2) inability to blind subjects to their assigned group (Burkle et al., 2001); (3) costs (Heathfield et al., 1998); and (4) limited external validity (Heathfield et al., 1998).

- When faced with the challenge of evaluating complex systems which have been implemented in a less than standardized fashion, it is reasonable to focus on the form and function of the systems implemented (i.e. the concept of a total health record) instead of trying to distinguish, for evaluation purposes, the difference between different systems (Heathfield et al., 1999).

- Lessons learned from the evaluation of district health information systems in South Africa include: (1) avoid the use of overly complex handbooks and guides to evaluation or instruments; (2) identify core evaluation criteria which can be

used for either self assessment by the participating sites or as baseline assessments for the project as a whole; and (3) develop evaluation protocols in consultation with the sites (Hammer, 1999).

Neville et al. (2004) also outlined seven steps to follow in designing and carrying out an evaluation study:

Step 1. Identify key stakeholders from a range of disciplines who would be considered core to an evaluation of the information systems initiative. These stakeholders should be engaged early in the planning of the evaluation.

Step 2. Following the compilation of the key stakeholder list, stakeholders should be oriented to the information systems and evaluation initiatives and agreement should be reached on why an evaluation is needed. Stakeholders should be oriented to the information systems initiative and the evaluation process as early as possible to determine their expectations of the information systems initiative and perspectives on what the evaluation should address. The authors note that an interactive workshop format has proved useful for this type of stakeholder engagement. The work of Heathfield et al. (1998) around the three general types of rationale for conducting an evaluation in the field of health information systems is emphasized, i.e. to ensure accountability for expenditure of resources; to develop and strengthen performance of agencies, individuals and/or systems; and, to develop new knowledge. While many evaluations focus on performance enhancement and knowledge development, the authors note that accountability is

a strong value in Canadian society in general and increasingly in the health and technology sector, and therefore some type of accountability question(s) should be included in the evaluation.

Step 3. Reach agreement on when to evaluate (e.g. pre-implementation, post-implementation, multiple data points, etc). It is recommended that, whenever possible, the evaluation should involve data collection at 3 or more points: (1) baseline (pre- implementation); (2) during implementation and (3) post-implementation (preferably at 6 and 12 months post-implementation). The authors recognized that many information systems initiatives are introduced or are about to be introduced before the initiation of the evaluation and pre-implementation data collection is not always possible. However, they suggest that pre-implementation data may be available from pre-existing documentation, such as project scoping documents, compiled prior to system implementation.

Step 4. Reach agreement on what to evaluate. A priority setting exercise with key stakeholders is recommended to identify the questions that are important to address in the evaluation and to ensure that all key stakeholders have an investment in the evaluation project. One approach to priority setting would be to build on the stakeholder identification of why an evaluation is important (i.e. accountability, performance enhancement and/or knowledge development) and then identify core and optional questions within each category.

Step 5. Reach agreement on how to evaluate. In deciding on the methods for the evaluation, consideration should be given to the resources available to carry out the evaluation. In addition, the authors support the recommendations of Kaplan (1997) that the evaluation focus on a variety of concerns, use multiple methods, be modifiable, be longitudinal and include both formative and summative approaches. There is also support for the work of Grant, Plante and Leblanc (2002) that suggests the evaluation should be timely, realistic and practical and endorsed by key stakeholders.

Step 6. Analyze and report on findings. It is recommended that the findings from the evaluation be shared with key stakeholders identified in Step 1, preferably in a workshop setting. This approach will enable discussion of the interpretation and implications of the results obtained through the different components of the evaluation or through the use of multiple methods. The authors point out that many researchers have noted that the task of consolidating the findings of a multi-method evaluation is one of the most difficult components of the study of complex health information systems initiatives (Heathfield et al., 1999; Herbst, Littlejohns, Rawlinson, Collinson & Wyatt, 1999; Moehr, 2002; Lau, 1999).

Step 7. Agree on recommendations and forward them to key stakeholders. In addition to the evaluation team, the stakeholders who were involved in the planning of the evaluation should be involved in generating the recommendations which arise from the findings of the evaluation.

Towards an Evaluation Framework for Electronic Health Records Initiatives: A Proposal for an Evaluation Framework, by Neville et al. (2004), was chosen as the approach to guide the present study as it was considered the most appropriate in terms of its theoretical base, recommendations and its practical guidance for the design and conduct of evaluation studies of health ICT initiatives. As the guide does not prescribe the exact measures or dimensions to include in the evaluation, it facilitates flexibility that is needed to address the evaluation perspectives represented by all key stakeholders. Its flexibility also allows for the incorporation of important elements and measures that have been identified through the review of evaluation approaches as presented above, as well as prior evaluation studies that have been presented in the literature and discussed below.

2.3.2 Evaluation Studies of the Impact of Information and Communication Technology in Primary Health Care Settings

Not unexpectedly, a review of the literature did not detect any studies that evaluated the impact of enhancing information and communications technology (ICT) in a community-model primary health care setting that encompassed the same technical or functional enhancements as in the present study. However, numerous studies were identified that focused on one or more aspects relevant to the present study. Studies were also found that evaluated aspects of health information and communication technologies that were considered outside the scope of the present study and were therefore omitted from the review of the literature below. Among these were studies that focused specifically on pharmacy or computerized provider order entry (CPOE) systems (e.g.

Kawasumi et al, 2008), decision support systems (e.g. Palen, Raebel, Lyons & Magid, 2006) and cost-benefit or economic analyses (e.g. Wang et al., 2003).

A number of studies have examined the impact of electronic medical record (EMR) and other computerized systems on user satisfaction, efficiency and administrative functioning and the process and quality of care in a primary health care setting. Most studies have focused on user perceptions and have employed a cross-sectional survey design (e.g. Joos, Chen, Jirjis & Johnson, 2006; Sittig, Kuperman &Fiskio, 1999; Litaker, Ritter, Ober & Aron, 2005; Pagliari et al., 2005; Chin & McClure, 1995; Kemper, Uren & Clark, 2006; Keshavjee, Troyan, Holbrook & VanderMlen, 2001). Some studies have used qualitative methods (e.g. Wager et al., 2000; Lee, 2007) or a mixed-methods approach (e.g. Marshall & Chin, 1998). Few studies have used other designs such as time-motion studies (e.g. Pizziferri et al., 2005), comparisons of patient outcomes (e.g. O'Connor et al., 2005; Crosson et al., 2007; Garrido, Jamieson, Zhou, Wiesenthal & Liang, 2005) and the completion of preventative care services (e.g. Gill et al., 2001; Adams, Mann & Bauchner, 2003) in practices with and without an EMR. Table 2 lists some of the attributes examined in prior studies.

Table 2. Attributes Examined in Evaluation Studies of Information and Communication Technology in Primary Health Care

ATTRIBUTE	REFERENCE
User Satisfaction	
Ease of use/user friendliness	Chin and McClure, 1995; Litaker et al., 2005; Urkin, Goldfarb and Weintraub, 2003; Adams, Mann and Bauchner, 2003
Effort required to use	Chin and McClure, 1995
Desire to return to the old system	Chin and McClure, 1995
System utilization	Chin and McClure, 1995; Pagliari et al., 2005
System response time/speed	Chin and McClure, 1995; Sittig et al., 1999; Joos et al., 2006
System reliability or stability	Sittig et al, 1999; Litaker et al., 2005; Pagliari et al., 2005; Urkin et al., 2003
Completeness of system functionality	Pagliari et al., 2005
Ease of access	Litaker et al., 2005; Joos et al., 2006
Meet provider needs	Urkin et al., 2003
Training	Lee, 2007
Recommend system to other practices	Adams et al., 2003
Desire to expand system	Moorman, Branger, van der Kam, and van der Lei, 2001
Outside access to system	Joos et al., 2006
Efficiency and Administrative Functioning	
Amount of paper work	Keshavjee et al., 2001; Pagliari et al., 2005; Litaker et al., 2005
Number of patients seen	Keshavjee et al., 2001; Pagliari et al., 2005
Ability to access data in a timely manner	Pagliari et al., 2005; Joos et al., 2006
Number of ER visits	Litaker et al., 2005
Confidentiality of patient information	Litaker et al., 2005; Kemper et al., 2006; Urkin et al., 2003
Duplication of data collection/investigations	Pagliari et al., 2005; Urkin et al., 2003
Overall communication with other staff	Kemper et al., 2006; Urkin et al., 2003; Follen et al., 2007
Effort to communicate with other staff	Joos et al., 2006
Timeliness of communication with other staff	Joos et al., 2006
Organization of work	Joos et al., 2006; Urkin et al., 2003
Overall productivity	Kemper et al., 2006

Table 2. Attributes Examined in Evaluation Studies of Information and Communication Technology in Primary Health Care (continued)

ATTRIBUTE	REFERENCE
Efficiency and Administrative Functioning	
Overall efficiency	Litaker et al., 2005; Follen et al., 2007
Ease of documentation	Kemper et al., 2006; Urkin et al., 2003
Workload/amount of work	Kemper et al., 2006; Urkin et al., 2003; Adams et al., 2003
Filing reports	Urkin et al., 2003
Availability of/access to information	Urkin et al., 2003; Kemper et al., 2006
Cost savings	Kemper et al., 2006; Litaker et al., 2005
Effort to research literature	Joos et al., 2006
Effort to review patient information	Joos et al., 2006; Moorman et al., 2001
Work-life balance	Joos et al., 2006
Clarity about other providers responsibilities	Moorman et al., 2001
Time savings and time spent on specific tasks	Keshavjee et al., 2001; Litaker et al., 2005; Pagliari et al., 2005; Chin and McClure, 1995; Urkin et al., 2003; Moorman et al., 2001; O'Neill and Klepack, 2007
Process and Quality of Care	
Patient satisfaction/acceptance	Chin and McClure, 1995; Urkin et al., 2003; Adams et al., 2003 ; Garrison, Bernard and Rasmussen, 2002
Clinical decision making	Pagliari et al., 2005
Timeliness of patient referrals	Marshall and Chin, 1998
Patient-provider interaction	Marshall and Chin, 1998; Urkin et al., 2003; Adams et al., 2003
Clarity of patient record	Pagliari et al., 2005
Ability to act on test results in timely manner	Marshall and Chin, 1998
Adherence to clinical practice guidelines	Marshall and Chin, 1998; O'Connor et al., 2005
Ability to detect errors	Marshall and Chin, 1998
Risk of medical errors	Litaker et al., 2005; Kemper et al., 2006
Ability to monitor patient progress	Litaker et al., 2005
Number of tests ordered	Litaker et al., 2005

Table 2. Attributes Examined in Evaluation Studies of Information and Communication Technology in Primary Health Care (continued)

ATTRIBUTE	REFERENCE
Process and Quality of Care	
Information sharing	Pagliari et al., 2005
Coordinate of care	Marshall and Chin, 1998
Patient wait times	Litaker et al., 2005
Documentation completeness	Joos et al., 2006; Kemper et al., 2006; Adams et al., 2003; Larrabee et al., 2001; Hawkins, 2000; Hippisley-Cox et al., 2003
Access to/availability of information	Joos et al., 2006; Kemper et al., 2006; Urkin et al., 2003; Moorman et al., 2001
Timeliness of information	Joos et al., 2006; Moorman et al., 2001
Ability to practice evidence based medicine	Joos et al., 2006
Patient safety	Joos et al., 2006
More effective follow-up	Urkin et al., 2003
Provision of preventative care	Urkin et al., 2003 ; Adams et al., 2003; Gill et al., 2001
Patient outcomes	Follen et al., 2007; Crosson et al., 2007; Branger et al., 1999
Overall quality of care	Marshall and Chin, 1998; Litaker et al., 2005; Pagliari et al., 2005; Kemper et al., 2006; Joos et al., 2006; Adams et al., 2003; Moorman et al., 2001

User satisfaction with technical aspects of EMR and computerized record systems is highly system specific and there is evidence that user satisfaction is greater when users are involved in system development. Joos et al. (2006), for example, carried out a study in a primary care and urgent care clinic within an academic hospital in which they asked physicians to compare their EMR system with their memory of before the system. The system included access to all internally generated notes, reports and laboratory values. In addition, all outside documents were scanned and added to the EMR. The system also included an electronic messaging system and a reminder system. Workstations were installed in all exam rooms, nursing stations and offices. Of the seventy surveys distributed to staff physicians, 46 were returned completed (66%). A majority of respondents indicated that they used all of the EMR features, ranging from 41% to 93% among features. Most respondents indicated that they were satisfied with the reliability of the system (62%) and felt that they were adequately trained (76%) and that there was help available when needed (78%); more than half (53%) felt that the EMR was too slow. Further analysis revealed that satisfaction with system implementation was moderately correlated with involvement in system development (Spearman's Rho = 0.27, $p = 0.07$). Sex, computer skill and years in practice were not associated with higher levels of acceptance, however more satisfied respondents reported higher use of the system ($p = 0.03$).

In a similar study of user satisfaction with an EMR among a group of 75 primary care physicians at the Brigham and Women's Physician Hospital Organization in Boston, Massachusetts (Sittig et al., 1999), it was found that overall satisfaction was most highly

correlated with screen design and layout. This was attributed to the fact that system developers worked closely with a group of clinicians in designing the system and that it has been continually revised and improved based on user feedback. Overall satisfaction was least highly correlated with system response time and reliability. The authors concluded that EMR systems should be tailored to optimize workflow, rather than simply have adequate response time.

Further related to the recommendation that EMRs be tailored to optimize workflow, studies that have assessed the impact of computerized information systems on administrative functioning following computerization have had mixed results, with less time required to carry out some tasks and increased time to carry out other tasks. Using a pre-/post-implementation design, Keshavjee and colleagues (2001) carried out a study, COMPETE (computerization of medical practices for the enhancement of therapeutic effectiveness), to evaluate the impact of a commercial EMR system on practice efficiency, quality of care and privacy concerns in 18 community-based family physician offices in Hamilton, Ontario. EMR functionality included billing and scheduling capabilities, automated referral letters, electronic charting, a prescription module including drug interaction checks, look up resources and the ability to receive and review laboratory results electronically. Physician offices had workstations available in the exam room and at reception and most practices used a combination of electronic and paper charts. Questionnaires were developed for the study to collect self-reported estimates of the amount of time spent on various administrative and clinical tasks, including tasks that were hypothesized to improve with EMR implementation and tasks that were not as

controls. Administrative measures, carried out by staff other than physicians, included time spent pulling charts, doing billing and writing in charts. Physician related clinical measures included time spent writing in charts, reviewing laboratory results, writing prescriptions and reviewing consult notes. Physicians were also asked whether they felt that they worked a longer day, spent more time charting, have work left at the end of the day, saved time elsewhere during the day and if they had a better quality chart, used less paper and saw more or less patients during the day. Data collection was carried out pre-implementation and at six and eighteen months post-implementation. Study results found efficiency gains in the billing process, pulling patient charts, handling laboratory results and preparing referral letters, repeat prescriptions and follow-up notes. Among physicians, the amount of time spent writing in patient charts remained the same or increased post-implementation, however most physicians felt that they were saving sufficient time elsewhere during the day. A limitation of the study is that time allocations were based on self-report and recall, however the data collection method remained unchanged pre-/post-implementation. An additional important point is that physicians were given access to the EMR system for a nominal monthly fee in exchange for participating in the study. These limitations may have resulted in error and bias in the self-report data.

In a national study of the adoption of electronic health records in primary care paediatric practices in the United States (Kemper et al., 2006), attitudes towards electronic health records (EHRs) were compared among physicians with and without an EHR. For the purpose of the study, EHR was defined as "a computerized replacement of

the paper medical chart as the primary source of patient information". Separate survey instruments were developed for those with and without an EHR. For those with an EHR, the survey included forty questions that explored functionality and use of the EHR, perceived benefits of the EHR, reasons for and barriers to implementation, internet access and practice characteristics. For those without an EHR, the survey consisted of thirty one questions that explored attitudes towards EHRs, future plans to implement an EHR, barriers to implementation and practice characteristics. Both surveys consisted of multiple choice and Likert scale questions. Surveys were distributed by mail to a random sample of 901 paediatricians from across the United States; response rate was 58%. Among those who responded, 21.3% reported having an EHR in their practice and approximately half (54.3%) of those without an EHR reported that they were planning to implement one in the future. Nearly three quarters (71.6%) of those with an EHR reported that paper-based records were not as good as EHRs, compared to less than half (42.5%) of those without an EHR. Regardless of whether the practice did or did not have an EHR, a majority of respondents suggested that EHRs could have a positive impact on practice operations including improved office productivity (76.7% and 73.4%, respectively), improved access to patient information (93.5% and 87.8%, respectively), improved communication with providers outside the practice (83.3% and 81.7%, respectively), easier documentation (64.8% and 67.1%, respectively) and improved confidentiality and security of patient information (64.4% and 49.3%, respectively). Increased physician and staff workload (63.7% and 55.3%, respectively) were among perceived barriers to EHR implementation.

Wager et al. (2000) conducted a qualitative study to examine the impact of a commercial EMR system among experienced users (i.e. had been using the system for at least two years) in five community-based primary care practices. A qualitative research methodology was chosen as it would provide rich, meaningful information which could be used to develop a subsequent study to obtain more objective, generalizable results. A total of 66 semi-structured interviews were carried out with physicians, physician assistants, nurses and support staff, either one-on-one or in small groups. Questions were asked regarding users experiences with the EMR, its perceived advantages and disadvantages and its impact on their work lives. Interviews were conducted in an interactive, informal manner permitting exploration of areas of interest. In addition, observations were made of physicians and physician assistants using the EMR in practice. Summaries from each interview were given to interviewees to review for accuracy and data were independently analyzed by three members of the research team to ensure consistency of emerging themes. Study results were mixed, particularly among user groups (i.e. physicians, nurses and support staff) in terms of the impact on the quality of documentation, efficiency, communication, ease of use and cost savings. The most frequently cited advantages of the system were that it allowed multiple users to have access to records that were organized, legible and complete and it allowed them to perform searchers that would be near impossible with a paper-based system. The most frequently cited disadvantage or limitation was system downtime. Findings also revealed that organizational context, one of the four Cs of information systems evaluation described by Kaplan (1997 & 1998), was a major determinant of perceived success or

failure of the EMR system. By comparing findings among practice sites that were similar with respect to setting and types of patients, critical success factors were identified including leadership, whether there was a champion of the system, availability of initial and on-going training and local technical support, adequate resource commitment and the degree to which staff had the opportunity to overcome their fears and gain confidence in using the system. The extent to which the practice continued to use a paper-based system after EMR implementation influenced whether users perceived cost savings in terms of time and money.

Using a time-motion study design, Pizziferri et al. (2005) carried out a pre-/post-implementation study to assess the impact of an EHR system on physician time utilization in five primary care clinics in the Partners Healthcare System in the United States. Clinics included hospital-based practices, community practices and neighborhood health centers. The EHR implemented in all clinics was the Longitudinal Medical Record (LMR), a web-based application designed and used internally by Partners Healthcare System. The LMR incorporates clinical data such as medications, allergies, problem lists and tools such as charting, results management, referral management, order entry, decision support and reminders for health maintenance. Prior to system implementation, physicians could write by hand or dictate notes. Prescriptions were hand written and laboratory results could be viewed electronically. A paper-based chart system was maintained and used by physicians during clinic sessions. Following system implementation, physicians were still able to dictate or handwrite notes and prescriptions or, alternately, use the EHR for these tasks. Encounter forms and test order requisitions

continued to be paper-based. Continuous time-motion observations were performed before and after EHR implementation by seven research assistants. Observers followed physicians during their entire clinic session and directly timed pre-determined tasks. Post-implementation observations were carried out when the clinics were judged to be in a steady state of routine EHR use. Between two and seven physicians were observed at each site, with twenty four physicians observed in total. Sixteen physicians were observed before and after system implementation, four were observed before only and four were observed after only. An extensive list of tasks were adapted from a prior study of physician time utilization (Overhage, Perkins, Tierney & McDonald, 2001 as cited in Pizziferri et al., 2005) including time spent looking for charts, reading schedules, writing orders, dictating notes, examining patients and talking to patients. Individual tasks observed were grouped into six analysis categories including "direct patient care", "indirect patient care-write", "indirect patient care-read", "indirect patient care-other", "administrative" and "miscellaneous". After all post-implementation observations had been completed, a survey was administered to all physicians in the five participating clinics, regardless of whether they were included in the time-motion component of the study, to assess physician estimates of the amount of time spent in patient documentation outside the clinic session and perceptions of the EHR. Results indicated that the distribution of time spent in indirect patient care by phone, paper and computer changed post-implementation, while the total amount of time spent per patient was similar. There were no statistically significant differences in time spent in any of six analysis categories pre- and post-implementation, with the exception of a 0.88 minute increase ($p = 0.029$) in

the category "indirect patient care-read". Completed surveys were returned by 43% of physicians, including fifteen physicians that had been observed in the time-motion component of the study. Physicians reported a mean increase in the amount of time spent in patient documentation post-implementation (6.9 min pre vs 9.9 min post). Physicians were also asked to rate the EHR on a scale of one to five in comparison to the paper-based system, with one being the worst and five being the best. Scores indicated that the physicians believed the EHR resulted in improvements in quality of care, access to patient information and communicating within and outside the practice, but had a negative impact on workload. Overall satisfaction with the EHR was rated 3.5 on a scale of one to five. Observations thus showed that there was no difference in the amount of time spent on physician tasks pre- and post-implementation, while survey data suggested that physicians felt that their workload had increased as a result of the EHR. Nevertheless, physicians indicated that they were satisfied with the EHR system overall and felt that it had a positive impact on important aspects of patient care.

Marshall and Chin (1998) examined the impact of an outpatient EMR system in a large HMO in Kaiser Permanente. Clinicians use the EMR to enter and review clinical notes, enter prescriptions, order laboratory and diagnostic tests and review results, view appointments and admission data, construct medication lists and make patient referrals. The system also incorporates guidelines for medication and diagnostic test ordering and referrals. The study used a cross-sectional design and employed both a survey and key informant interviews. Study participants included physicians, physician assistants, nurse practitioners, optometrists and mental health professionals. Clinicians were asked to

assess how separate components of the EMR system affected the overall quality of healthcare, the quality and content of the patient-clinician interaction, adherence to clinical practice guidelines, detection of medication errors, coordination of patient care with other departments, ability to act on test results in a timely fashion and patient referral. A unique feature of the study was the calculation and comparison of benefit/effort ratios. Participants were asked to rate the relative effort required to use specific components of the EMR as well as the relative benefit to care on a scale of one to ten, where ten meant a great deal of effort or benefit. Mean benefit score, mean effort score and the mean benefit/effort ratio were calculated and compared for each component. A benefit/effort ratio that was greater than one indicated that the benefit to patient care outweighed the effort required to use that component of the system. Findings of the study suggest that clinicians perceive an improvement in patient care as a result of using an EMR system and that the ability to retrieve clinical information such as laboratory results, prescribed medications and dictated reports is of greater value compared to an online charting and ordering system, as shown by the benefit/effort ratios.

Studies that have evaluated the impact of electronic record systems on quality of care have also had mixed results. A number of studies have assessed health care provider and staff perceptions of an EMR on overall quality of care by asking them to indicate, using a Likert scale, the extent to which they agree with the statement (or some variant thereof), "the new system improves quality of care" (e.g. Marshall and Chin, 1998; Litaker et al., 2005; Joos et al., 2006; Kemper et al., 2005; Adams et al., 2003). Some studies have included more specific survey items associated with quality of care, for

example the impact of the system on patient safety (Joos et al., 2006), risk of medical errors (Kemper et al., 2005), patient-provider interaction (Marshall & Chin, 1998), clinical decision making (Pagliari et al., 2005) and patient satisfaction or acceptance (Chin and McClure, 1995; Urkin et al., 2003; Garrison et al. (2002). In general, findings from such studies suggest a moderately positive impact of EMRs on quality of care, however respondents were often asked to compare the new system with their memory of the old system, which may introduce recall bias into the study findings.

Garrison and colleagues (2002) assessed patients' views of computer use during consultation and its effect on patient satisfaction in a family medicine clinic before and after implementation of an electronic environment. The clinic had 24 residents, two nurse practitioners and nine staff physicians and approximately 49,000 visits per year. In each exam room, clinicians could access progress notes, hospital discharge summaries, laboratory results and radiology reports. Overall satisfaction with care received at the clinic was the main outcome measure. Taking into account the expected effect size, a random sample of 500 patients that had one or more specific chronic diseases in which the patient-provider relationship would be expected to play a central role in management were chosen to receive a mail-out survey; response rate was 63.6%. The questionnaire assessed patients' views of overall satisfaction with health care and the effect of computers on provider-patient relationship and patient satisfaction. Results on overall satisfaction were compared with the results of a patient satisfaction survey that was carried out at the clinic five years prior when the clinic still used a paper chart. Findings showed that a majority of patients (74.6%) thought that computer use had an overall

positive impact on quality of care as well as on specific aspects of the physician-patient relationship such as the quality of face-to-face communications and the physicians' willingness to listen. There was a positive association between a physician's computer skills, as assessed by the patient, and patient satisfaction with the effect of the computer on the visit. In comparison to findings of the pre-implementation survey, there was no statistically significant difference between overall satisfaction with health care received before and after the introduction of an electronic environment (83.5% vs 81.0%). The authors note that the reason patient perceptions of increased quality of care with computer use remains unclear, but may be linked to perceived improvements in completeness of documentation, increased performance of preventative tasks, ease of access to medical histories and educational materials or it may be that computers are becoming so commonplace in society that patients expect their providers to use them as a symbol of modern health care.

Using a pre-/post-implementation study design, Singh, Servoss, Kalsman, Fox & Singh (2004) examined the impact of an EMR on quality of care in an academic rural primary care practice in New York State, with a specific focus on patient safety. While the response rate is not clear based on the results presented, a survey was administered to all thirty-two staff, including physicians, nurses and administrative staff, at baseline and one year later, following partial implementation. At the time of the second survey, the EMR was being used for scheduling and prescribing only. Paper charts were used for progress notes, laboratory tests, x-rays and other documents. Physicians generally carried a laptop and paper chart into the exam room. The survey instrument was the Perceived

Hazard Questionnaire and was used to obtain perceptions of the frequency and severity of multiple primary care errors in twelve domains including: 1) reception, 2) nurse, 3) nurse-patient interaction, 4) nurse-chart interaction, 5) patient: assessment, 6) physician: assessment, 7) physician-patient interaction: assessment, 8) physician-chart interaction, 9) nurse-physician interaction, 10) physician: plan, 11) physician-patient interaction: plan and 12) patient: plan. For each error, a hazard score was calculated based on the product of frequency and severity and hazard scores were compared pre- and post-implementation. Although information was limited on the statistical methods used to compare findings pre-/post-implementation, results suggested improvements in patient safety in the domains of "physician-chart interaction" (hazard score [HS] 17.72 vs 14.82), "nurse-physician interaction" (HS 9.92 vs 6.99) and "patient: plan" (HS 12.91 vs. 10.92). On the other hand, safety appears to have been adversely affected in the other domains including "nurse-chart interaction" (HS 18.73 vs 28.26) and "patient: assessment" (HS 14.10 vs 22.80). The authors noted that the greatest adverse effects were in the domains that were perceived to be two of the most hazardous before EMR implementation and may have been related to the fact that both an electronic and paper-based system were being used simultaneously. In addition, the greatest reduction in vulnerabilities were in the domains of "physician-chart interaction" and "patient: plan" and is thought to be a reflection of improved communication and reliability offered by the EMR.

Findings from studies that have assessed the impact of electronic information systems on patient outcomes or intermediate measures of quality of care have also been mixed. Garrido et al. (2005), for example, carried out a cross-sectional study to assess the

impact of an electronic health record system in two regions of Kaiser Permanente, the Colorado region and the Northwest region. While the two regions implemented different systems, they share similar functional characteristics (see Marshall & Chin, 1998 above for description of system characteristics). Secondary analysis of data collated by the National Committee for Quality Assurance was carried out with a sample of 367,795 and 449,728 patients in the two regions, respectively. Three indicators were selected for inclusion in the study: the percentage of patients receiving advice on smoking, cervical cancer screening and retinal examination in diabetes. Where available, data was extracted for three years prior to implementation, two years during implementation and four years after implementation. Results showed that these measures of quality of care remained unchanged or improved slightly post-implementation. The same study also showed that there was a statistically significant decrease in the number of primary and secondary care visits following implementation of the EMR in both regions by 5-11%. This suggests that, while the EMR did not result in a major improvement in quality of care measures, it did contribute to a decrease in service use without compromising quality of care.

Crosson and colleagues (2007) studied the impact of an EMR on diabetes care. Data from twenty charts at each of fifty family medicine practices in New Jersey and Pennsylvania were analyzed to assess quality of care by measuring adherence to guidelines for process of care, treatment and achievement of intermediate outcomes for patients with diabetes. Clinics had similarly trained primary care physicians, similar patient populations and used similar diabetes care guidelines. Results showed that, after controlling for cofounders, patients with diabetes in thirty-seven practices that did not

have an EMR were significantly more likely to have received care that met the guidelines for process of care (odds ratio [OR] 2.25), treatment (OR 1.67) and intermediate outcomes (OR 2.68), than the 13 practices using an EMR. In contrast, O'Connor et al. (2005) found that an EMR led to increased frequency of recommended tests (HbA1c or LDL levels), but with no difference in outcomes between EMR clinics and non-EMR clinics. The EMR evaluated in the study by O'Connor et al. (2005) provided decision support including prompts and reminders for diabetes, which may or may not have been present in EMR systems assessed in other studies that have had less favourable results.

Studies that have assessed the impact of an EMR on the provision of preventative services, such as immunizations and screening tests, have also had favourable results. The EMR systems assessed in these studies have generally included structured assessment tools, guidelines and/or reminder prompts for the provision of preventative care services (e.g. Gill et al., 2001; Adams et al., 2003). A review of studies published between 1966 and 1999 that have assessed the effectiveness of EMRs as tools for improving intermediate patient outcomes concluded that EMRs offer great potential for improving health maintenance and screening in primary care through the generation of reminders. However, it is difficult to make firm conclusions given that studies are of varying quality, conducted in dissimilar centers and employed a variety of EMRs (Jerant & Hill, 2000).

In addition to studies that have evaluated the impact of EMR systems in the primary health care setting, several studies (e.g. Moorman et al., 2001; Branger, van't Hooft, van der Wouden, Moorman & van Bemmel, 1999; Branger et al., 1992; Sicotte &

Lehoux, 2003; Safran et al., 1998; Helleso, Sorensen & Lorensen, 2005; Lang et al., 2006) have assessed the impact of electronic communication, via EMR or other computerized system, between health care providers or levels of care. Branger and colleagues (1992, 1999 & Moorman et al., 2001), for example, studied the impact of electronic data interchange between providers of primary and secondary care. Electronic data interchange (EDI) has been defined as "the replacement of paper documents by standard electronic messages conveyed from one computer to another without manual intervention" (Walker, 1989 as cited in Branger et al., 1999). In an early study, Branger et al. (1992) showed that using electronic communication of admission-discharge reports and laboratory reports between hospital and general practitioners (GPs) improved the speed of communication, reduced transcription errors and had the potential to decrease workload for general practitioners. In a later study, Branger and colleagues (1999) again evaluated the value of electronic communication in improving glycemic control and documentation of care received by diabetes patients and communication between different providers simultaneously treating a patient, at an outpatient clinic in the Netherlands. The study included 32 GPs that used the same computer-based patient record system as well as an internal medicine consultant, located externally. Through EDI, the complete medical record or sections of it could be electronically transmitted between GPs and the internal medicine consultant. The message could contain both clinical and administrative data. The system tracked diabetes patients who were treated by another physician and prompted the physician to compose a message to the other provider at the end of the clinical encounter. To assess the value of EDI, the thirty-two

GPs were divided into two groups, those who regularly referred patients to the outpatient clinic (n = 20) and those who occasionally referred patients (n = 12). Those who regularly referred patients received the EDI communication module and those who occasionally referred patients were the control group. The study population included 215 patients treated by GPs in the intervention group and 60 patients treated by GPs in the control group. The number of letters sent and received and the number of diabetes parameters recorded was collected and compared for a one-year period prior to and after implementation. HbA1c levels were compared for the six month pre- and post-implementation. Intervention GPs received more letters per year than control GPs (1.6 vs 0.5 per patient, $p < 0.05$) and there was a significantly higher availability of various diabetes-related parameters in the intervention group. While differences in HbA1c levels were not statistically significant, findings suggest that EDI may be a valuable tool for improving communication between providers and increasing availability of data to GPs for care provided elsewhere, thereby contributing to better overall quality of care.

Using an ethnographic approach and cognitive evaluation techniques, Safran et al. (1998) examined the effects of electronic communication, including an EMR system and e-mail, on collaborative processes among team members in an outpatient clinic delivering primary care at Boston's Beth Israel Deaconess Medical Center. The study sample included a multidisciplinary team of physicians, nurses, social workers, mental health care providers, as well as administrative staff. At the time of the study, the electronic communication system had been in place for at least five years and access to the system was widely available through terminals located in exam rooms, conference rooms, work

rooms, hallways and secretaries' desks. Data were collected over two periods of two weeks each, whereby key practitioners were accompanied as they went about their daily activities. Detailed field observations and video/audio recording of all interactions were made. Semi-structured interviews were conducted with patients to explore their attitudes of the computer system and the providers who used them. Data were analyzed to examine social dynamics of the decision-making process, group strategies and processes through which decisions are made, peer influences and organizational influences on decision-making. Results were compared to characteristics of primary care units with paper-based systems and traditional forms of communication to assess differences between sites with and without computerized systems. Findings suggested that the computerized patient record and e-mail system improved communication among clinicians, supported collaboration among team members, and improved access to information to support decision making. Patients were accepting of the system with no reports of the system interfering with patient-provider interactions. The computer system was found to be particularly important for team functioning and collaboration as it was a regularly used resource by providers on-site and off-site when teams were discussing an issue. By comparing findings with characteristics of more traditional primary care offices, it was observed that the easy access to electronic patient records increased the likelihood that they are consulted in discussing an issue with a patient or among providers. Email was also reported and observed to be a major facilitator of communication among team members. In comparison to voice-mail which serves a similar function and is often used in clinics that are not computerized, email is less time consuming, easier to screen,

creates a written record of the communication and allows the provider to attend to the communication when it is convenient, which can improve efficiency. The authors concluded that electronic records systems, particularly with email capabilities, have the potential to improve collaborative care. They caution, however, that email also has the potential to overload clinicians with unwanted or unnecessary communication and that email capabilities should incorporate multi-media objects, provide internet access and allow documents to be attached so that messages can be brief with links to additional information as needed.

In addition to computerized information management systems and electronic communication tools, telemedicine or telehealth technology also has the potential to improve health care delivery by supporting the exchange of information among health care providers, as well as between patients and practitioners, particularly in rural and remote areas. In theory, telehealth technology should overcome the information gap experienced by consultants who have no direct access to the patient or the patient's chart, as well as improve access to higher levels of care services for patients in remote areas (Sicotte & Lehoux, 2003). While not carried out in a primary health care setting, Sicotte & Lehoux (2003) conducted a qualitative, multiple case study to examine how physicians perceive, make sense of and use telecommunication technology in their daily practice. The setting of the study was a tertiary care centre and three regional health care centres located in Quebec, Canada. Each site was equipped with the same telemedicine unit consisting of a videoconferencing and medical imagining solution. Each teleconsultation ($n = 16$) that took place during a one-year experimental teleconsultation project was

considered a separate case. Data collection included interviews with all users of the technology (n = 15) including six physicians with varying specialties at the three remote health care centres and nine physicians, also from a range of disciplines, at the tertiary care centre. Additional interviews were carried out with technical experts, promoters and managers involved in the project. Pre- and post-implementation questionnaires were also completed by both physicians during each teleconsultation. Additional data included observation notes, research diaries and meeting notes regarding the project's development. Findings revealed that the new technology was being used neither in the manner nor to the extent anticipated by the system designers. Findings further indicated that a majority of teleconsultation use was by a single regional hospital that was the furthest distance from the tertiary care centre. An increase in workload associated with teleconsultation use was observed for physicians, however users indicated that they were satisfied with the system to the extent that it allowed them to conduct real-time, face-to-face conversations from a distance. The authors suggest that an all-purpose telemedicine unit may not be appropriate for all settings and such technologies should be compatible with existing clinical routines.

In summary, previously conducted evaluation studies, as identified through a review of the literature and discussed above, provide evidence of a positive impact of ICT on team functioning, administrative functioning and quality of care in the primary health care setting. However, there is little evidence to support a positive impact of ICT on direct patient outcomes. While ICT is perceived to have a negative impact on workload and efficiency in some situations, it is generally viewed as a manageable trade

off given its potential to positively influence patient care. Most studies identified in the literature were retrospective evaluations without controls and conducted in professional-model primary health care settings in the US, which have well developed EMRs suited to their needs. Few studies were carried out in community-model primary health care settings or in the Canadian environment, focused on ICT enhancements other than EMRs or included primary health care team members other than physicians as study participants. While none of the previous studies are directly comparable to the present study with respect to evaluation approach, setting or type of technology assessed, they were valuable in identifying potential indicators and areas of focus for the evaluation.

3. METHODS AND PROCEDURES PHASE I: DEVELOPMENT OF THE EVALUATION PROTOCOL

The study was carried out in two phases. In phase I, the approach proposed by Neville et al. (2004) was used as a guide in the development of a protocol to evaluate the ICT enhancement project in the Connaigre Peninsula primary health care setting. Also in phase I, a review of existing documents and key informant interviews were used to collect contextual information for study sites. In phase II, the evaluation protocol was used to address the specific research questions identified in phase I.

Methods and procedures are presented according to the two study phases. Chapter 3 presents the methods and procedures for phase I. Phase I findings are presented in Chapter 4 in the form of an evaluation protocol. The evaluation protocol outlines the detailed methods and procedures for phase II. Findings for phase II are presented in Chapter 5.

3.1 Study Instruments

3.1.1 Proposal for an Evaluation Framework

Discussed in detail in Chapter 2, the approach proposed by Neville et al. (2004) outlined seven steps that were followed in the development of the evaluation framework:

Step 1. Identify key stakeholders

Step 2. Orient key stakeholders to the information system and evaluation initiatives and reach agreement on why an evaluation is needed

Step 3. Reach agreement on when to evaluate

Step 4. Reach agreement on what to evaluate

Step 5. Reach agreement on how to evaluate

Step 6. Analyze and report findings

Step 7. Agree on recommendations and forward them to key stakeholders

In addition, Neville et al. (2004) identified a number of key recommendations or messages for the evaluation of health information systems initiatives that emerged from the literature and that were considered in the development of the evaluation framework. Among these were the use of multiple methods and the inclusion of data collection strategies that are realistic and practical.

3.1.2 Review of Existing Documents

Tables were developed (see Chapter 4, Tables 3-5) to facilitate the collection of data through a review of existing documents pertaining to: 1) setting, 2) health services delivered, and 3) ICT capacity prior to the primary health care renewal initiative for each study site. Documents included: (a) transcripts of interviews conducted at the three study sites by the project management team prior to the initiation of the ICT enhancement project; (b) Electronic Health Record (EHR) for Primary Health Care (PHC) Requirements Report, which outlined the technical and functional enhancements required by the Connaigre Peninsula primary health care team as determined by the project management team during an extensive consultation process; (c) proposals submitted to the Office of Primary Health Care to establish or enhance primary health care teams; and d) a funding proposal submitted to the Office of Primary Health Care and the

Newfoundland and Labrador Centre for Health Information, which itemized the proposed ICT enhancements for the Connaigre Peninsula primary health care site.

3.1.3 Key Informant Interviews

A semi-structured interview guide (Appendix B) was developed that addressed three main areas: 1) setting, 2) health services delivered, and 3) ICT capacity at two points in time (i.e. prior to the primary health care renewal initiative and at the end of the primary health care renewal initiative). In addition to five open-ended questions, a checklist was developed and used to aid in describing the functional capabilities enabled through the technology. Key informant interviews were also used to validate data obtained through the review of existing documents as described above.

3.2 Data Collection

Phase I data collection was carried out between July 2005 and March 2006.

3.2.1 Proposal for an Evaluation Framework

As it was not always possible to carry out in sequence steps 1 through 7 of the evaluation framework approach described by Neville et al. (2004), there was some overlap in the timing of data collection to complete each step.

Step 1. A brainstorming session was held with the NLCHI project management team, followed by informal conversations through email, telephone and face-to-face to aid in the identification of key stakeholders. In addition, each time a communication took

place with a new stakeholder, they were asked to suggest other individuals or groups that may have an interest in the study (i.e. snowball approach). The stakeholder list is presented in Appendix C.

Step 2. *One-on-one consultations*. Meetings were held with the project management team and representatives of the provincial Office of Primary Health Care to discuss their interests in the evaluation. It was explained that the evaluation framework approach proposed by Neville et al (2004) would be used to guide the evaluation and, as such, additional consultations would be held with individuals representing multiple perspectives from the stakeholder list.

Pre-evaluation workshop. In addition to engaging the project management team and the Office of Primary Health Care, a total of 25 individuals, representing identified stakeholder interests, were invited to attend a half-day workshop at the Newfoundland and Labrador Centre for Health Information. Formal invitations were sent by email, followed by telephone follow-up. As this was considered a critical step in the development of the evaluation framework, travel-related expenses were included in the evaluation budget and reimbursed for workshop participants.

The workshop was attended by 17 individuals. Following an overview of the proposed ICT enhancements in the Connaigre Peninsula primary health care setting and the evaluation approach, participants were separated into three groups of 5-6 individuals, each of which included a cross-section of all stakeholders represented. In the break-out sessions, participants were asked to reflect on their current work processes, existing challenges in primary health care that ICT might improve and how they envision the

"ideal" primary health care environment. Participants were also asked to discuss their expectations for the enhancement of ICT in the Connaigre Peninsula primary health care setting and identify potential research questions to address in the evaluation. Following the one hour break-out session, a wrap-up session was held where each group gave a summary based on the discussions generated. Notes taken during the break-out session were also collected from each group.

Step 3. During the one-on-one consultations with the project management team and the Office of Primary Health Care, it was noted that a true pre-/post-implementation evaluation design would be difficult given that the Connaigre Peninsula primary health care site would receive a series of technical enhancements over time, as well as leverage existing technologies, rather than receive a single system with a clearly defined "before" and "after". In addition, the information and communication systems enhancement project was nearly ready to begin at the time of engagement of the evaluators. This limited the opportunity for pre-implementation data collection. It was also explained that, while randomized control trials (RCTs) are considered the gold standard approach, an RCT was not feasible for the current study as they are expensive and complicated to conduct and randomization of sites, providers or patients would not be possible. It was further explained that identifying quantifiable benefits in a RCT does not necessarily mean that end users will accept the system, nor does it lend itself to identifying important lessons learned. While less preferable than a pre-/post-implementation study, it was noted that an opportunity existed to carry out a post-implementation study or a case study that included pre-/post-implementation comparisons using pre-existing data and/or

comparisons with other similar sites. Following the discussion on the advantages and disadvantages of other study designs, an appropriate study design was agreed upon.

Step 4. Following stakeholder consultations, expected benefit areas and specific questions identified during the workshop and consultation meetings were categorized into themes or broad areas of interest and summarized in tabular format. Building on this, as well as prior evaluations of ICT initiatives in primary health care settings identified in the literature, three research questions and a series of indicator areas were identified to address in the evaluation.

A draft evaluation framework was circulated to individuals who participated in the stakeolder consultaton proces. Participants were asked to review the document to ensure that it accurately reflected their interests for the evaluation and to identify any additional questions or areas of interest that had not been previously identified. The document was also circulated to individuals that were invited to the workshop but did not attend. Feedback recieved suggested that the interests of all stakeholders who participated had been included.

Step 5. Following the establishment of the research questions and indicator areas, data collection methods and study instruments were developed in consultation with key stakeholders, particularly the IT Directors and Primary Health Care Coordinators. In developing the methods for the evaluation, consideration was given to available resources and feasibility of methods given that technical enhancements were already underway.

Step 6. Following discussions with the project management team and the Office of Primary Health Care around when to evaluate (step 3), a high level plan for analysis

and reporting was discussed and decided upon. A detailed analysis plan was later developed and included in the evaluation protocol.

Step 7. As part of the evaluation protocol, a knowledge transfer plan was developed that goes beyond passive diffusion of the study findings. To increase the uptake of knowledge generated from the research and its use in planning and decision-making, key stakeholders including the project management team, the Office of Primary Health Care and Primary Health Care Coordinators were consulted and provided input into identifying the most appropriate dissemination methods.

3.2.2 Review of Existing Documents

Documents were manually reviewed by the investigator. Relevant information related to setting, health services delivered and ICT capacity was summarized in Tables 3 to 5. Data collected through document review were validated through the key informant interviews.

3.2.3 Key Informant Interviews

Interviews were requested and carried out with a total of eight key informants including Primary Health Care Coordinators and IT Directors representing three primary health care settings, including the Connaigre Peninsula site. Each site had one Primary Health Care Coordinator and two IT Directors; one Director responsible for acute care facilities and another Director responsible for community health services. As one of the IT Directors was responsible for two of the three sites, only one interview was requested

with this individual, with questions relating to both sites. Primary Health Care Coordinators and IT Directors were chosen as key informants as these individuals were considered the most knowledgeable with respect to the primary health care services offered and the technical environment.

Initial contact with potential key informants was made via email (Appendix D) to introduce the study and inform them that they would later be contacted by telephone to request their participation in the study. Approximately one week following initial contact, potential key informants were contacted by telephone (see Appendix E) and asked to participate in the study. If a key informant agreed to participate, an interview was scheduled to take place at a later date.

At the time of the interview, key informants were contacted by telephone (Appendix F), the purpose of the study was explained, confidentiality was assured and the key informant was notified that a research assistant would be present to aid in note taking during the interview. Detailed notes were taken during the interview by the investigator, who was responsible for conducting the interview, as well as by the research assistant. Notes were typed directly following completion of the interview to increase legibility of the hand written responses. Notes taken by both individuals were compared to ensure accuracy and completeness. Where discrepancies were identified, clarification was sought from the key informant and other relevant sources. Interviews lasted between thirty and sixty minutes.

3.3 Data Analysis and Presentation

Data collected through interviews and document review were summarized in Tables 3 to 5. Tables were sent back to key informants for feedback and adjustments were made where appropriate. Along with data collected during stakeholder consultations, data collected through interviews and document review were used to inform the development of the evaluation protocol.

3.4 Ethical Considerations

Approval to carry out phase I was granted by the Human Investigation Committee (HIC) of Memorial University of Newfoundland in two steps; letters of approval were issued July 5th, 2005 and November 17, 2005 (Appendix G). Interviewees implied consent by verbally agreeing to participate in a telephone interview. The form used to obtain consent for the pre-evaluation workshop is presented in Appendix H. Electronic data records were stored on password protected computer files, and paper data records in a locked filing cabinet, in a secure area of the Newfoundland and Labrador Centre for Health Information (NLCHI). Study data will be retained for five years after the study is complete.

4. METHODS AND PROCEDURES PHASE II: EVALUATION STUDY

4.1 Study Design

The study is designed as a comparative case study. Given that the Connaigre Peninsula primary health care setting would receive a series of technical enhancements over time and leverage existing technologies rather than receive a single system with a clearly defined "before" and "after", it would be difficult to employ a pre-/post-implementation design. In addition, the ICT enhancement project was nearly ready to begin at the time of engagement of the evaluators, limiting the opportunity for pre-implementation data collection. Thus, it was agreed that the evaluation would be designed as a case study and include two additional primary health care settings as comparison sites.

A decision was also made to consider the complete technical environment at each study site at two times: before the primary health care renewal initiative (T1, prior to April 1, 2004) and at the end of the primary health care renewal initiative (T2, March 31, 2006). This decision was made as it was difficult to separate out specific technologies that were funded under the ICT enhancement project, as some enhancements depended on and/or leveraged existing systems and capabilities. Further, it was also difficult to separate out enhancements that occurred as part of the larger primary health care renewal initiative, but were not specific to the ICT enhancement project. When evaluating complex systems that have been implemented in a less than standardized fashion, it is reasonable to focus on the form and function of the systems implemented (i.e. the concept

of a total health record) instead of trying to distinguish the difference between different systems (Heathfield et al., 1999).

4.2 Sample and Setting

The target population for the evaluation is primary health care team members (including network providers and administrative support staff) in three primary health care settings and individuals responsible for overseeing the ICT enhancement project in the Connaigre Peninsula primary health care site. In addition to the Connaigre Peninsula site, the other two study sites were the Bonne Bay primary health care setting and the Twillingate/New World Island primary health care setting. The two comparison sites were recommended by the project management team based on findings of the needs assessment carried out prior to project initiation.

The three primary health care sites similar in terms of population size (i.e. 5,000-6,000), geography (i.e. encompasses several communities with distances from the secondary care centre of approximately 1.5-2 hrs), physical setting of primary health care team (i.e. a main site with one or more satellite clinics) and services provided (i.e. range of services including medical care, community health, acute and long-term care). Many of the challenges identified by each area were also similar, including difficulty in recruitment of health care providers, declining and aging population, service gaps and a lack of coordination of services provided. The primary health care team in each area was multi-disciplinary and included a range of service providers. However, the exact

composition of each team differed somewhat between sites. Tables 3 and 4 summarize the setting and health services delivered for each study site.

Table 3a. Geographic, Demographic and Socioeconomic Characteristics by Study Site

CHARACTERISTIC		BONNE BAY	CONNAIGRE PENINSULA	TWILLINGATE/ NEW WORLD ISLAND
Geography	Location on Island	Northern Peninsula	South coast	Northeast coast
	No. communities	16	14	29
	Largest/main community	Norris Point	Harbour Breton	Twillingate
	Max distance to main community	90 km	83 km	41 km
	Link between communities	Paved roads	Paved two lane highways except 2 only accessible by boat or air	Paved roads
Population (2006)	Total	4,535	4,305	5,370
	% change since 2001*	- 3 to 21%	- 2 to17%	- 4 to 39%
	Median Age (years)*	39-48	29-43	42 - 55
Education less than high school* (2006)		35-69%	38-73%	46-65%
Main Industry (2006) (Economic Zones)		Fishing, hunting and trapping	Fishing, hunting and trapping	Fishing, hunting and trapping
Personal Income per capita* (2006)		$12,500-$18,500	$10,400-$16,400	$12,000-$18,000
Social Assistance Rate*		3-22%	3-42%	3-22%

* Range across communities

Source: Government of Newfoundland and Labrador, Community Accounts www.communityaccounts.ca

Table 3b. Health Status by Study Site

CHARACTERISTIC	BONNE BAY[1]	CONNAIGRE PENINSULA[2]	TWILLINGATE/ NEW WORLD ISLAND[3]
Self assessed health status excellent/very good/good	58.7 %	62.4 %	66.7%
Smoking rate	27.2%	34.9%	19.2%
Rate of heavy drinking	36.8%	50.0%	40.2 %
% 18+ Overweight	37.8%	49.7%	42.4%
% 18+ Obese	24.5%	23.9%	28.7%
% regular family doctor	66.3%	65.5%	84.0%
Top 3 causes of hospitalization	1. Heart disease 2. Malignant neoplasms 3. Chronic obstructions and pulmonary diseases	1. Heart disease 2. Chronic obstructions and pulmonary diseases 3. Disease of intestine and peritoneum	1. Heart disease 2. Malignant neoplasms 3. Diseases of intestine and peritoneum

[1] Economic Zone 7
[2] Economic Zone 13
[3] Economic Zone 14

Source: Government of Newfoundland and Labrador, Community Accounts www.communityaccounts.ca

Table 3c. Challenges and Issues by Study Site

CATEGORY	BONNE BAY	CONNAIGRE PENNSULA	TWILLINGATE/ NEW WORLD ISLAND
Demographics	• Declining/aging population • Difficulty recruiting volunteers	--	• Population declining/aging • Need for home care increasing • Volunteer pool reduced
Geography	• Travel difficult during winter, resulting in inconsistencies in services	• Inconsistent service delivery in remote areas, particularly during winter • Difficult to bring team members together because of geography	• Accessibility issues
Health Care Delivery	• Poor linkage with necessary supports and services • Service gaps (e.g. mental health crisis) • Lack of knowledge/conflicting views regarding team member roles/scope of practice • Inconsistencies in levels of care throughout area • Generalist nature/dual roles of providers • Poor coordination of health promotion and disease prevention	• Linkage with and communication between organizational and private practice providers • Lack of paramedics at each site • No formal emergency transport in remote areas • Access to specialized services (e.g. expanded mental health services) • Lack of Health and Community Services staff	• Service gaps including addiction services, smoking cessation, rehab services, mental health services • Lack of continuity of care • Increased costs of care • Coordination of services/programs
Population Health	• High rates of risk factors for chronic diseases	--	• High rates of circulatory disease, cancer and diabetes • High smoking, obesity, inactivity, alcohol use, gambling

Table 3c. Challenges and Issues by Study Site (continued)

CATEGORY	BONNE BAY	CONNAIGRE PENNSULA	TWILLINGATE/ NEW WORLD ISLAND
Provider Shortages	• No compensation for fee-for-service physicians to work in collaboration and participate in health promotion • Recruitment and retention	• Lack of continuity of care due to physician turnover	• Recruitment and retention of providers • Lack of continuity of care due to physician turnover
Administration	• Regional standards versus perceived local needs • Lack of standardized referral procedure	• Two health boards managing staff • No formal means to identify where people go for services	--
Community Supports	--	--	• Difficulties mobilizing the community • Lack of activities/programs for seniors and youth • No mechanism for identifying community strengths/challenges
Technology	• Technology gaps including lack of access to Meditech, CRMS, Internet and e-mail for some sites and no access to telehealth • Incomplete medication records	• Two main information systems (Meditech/CRMS) • Lack of computers and connectivity within remote and district clinics • No telehealth capacity, no EHR • Lack of clinical usage of technology that exists • Meditech modules not yet complete • Lack of cell phone service in all areas	--

'--' indicates challenge/issue not identified by site

Source: Proposals to the Office of Primary Health Care (OPHC), Government of Newfoundland and Labrador

Table 4. Setting and Services Delivered by Study Site

CHARACTERISTIC		BONNE BAY	CONNAIGRE PENINSULA	TWILLINGATE/ NEW WORLD ISLAND
Primary Health Care Setting		Bonne Bay Health Centre located in Norris Point houses institutional and some community health services; clinics located in Trout River, Woody Point, Cow Head, Parsons Pond, Daniel's Harbour	Connaigre Peninsula Community Health Center houses institutional and community health services; clinics at Mose Ambrose and Hermitage; visiting clinics in Rencontre East, McCallum, Gaultois	Notre Dame Bay Memorial Health Centre houses institutional and community health services; clinic located in Summerford (New World Island Clinic)
Primary Health Care Team (defined by site)	Clinical	Physicians Nurse Practitioner Registered nurses (incl. inpatient)	Physicians Nurse Practitioners Registered Nurses (incl. inpatient) Licensed Practical Nurses	Physicians Nurse Practitioners Registered Nurses (incl. inpatient) Licensed Practical Nurses
	Community Health	Child, Youth and Family Services Social Worker Community Health Nurse Mental Health Social Worker Addictions Counselor Child Management/Behavior Management Specialist Community Supports Social Worker	Child, Youth and Family Services Social Worker Continuing Care Nurse Public Health Nurse Youth Corrections Officer	Child youth and Family services Social Worker Continuing Care Nurse Public Health Nurse Family Rehab Services Social Workers Continuing Care Social Worker
	Other Health Care Provider	Physiotherapist Dietician	Physiotherapy Aide Recreation Therapy Worker Laboratory/DI Techs	Physiotherapy Aid Laboratory/DI Techs Recreational Therapist Ambulance Attendants Diabetic Coordinator
	Management/ Administration	--	Primary Health Care Coordinator Facility Director Primary Health Care Facilitator Director Environmental Services Senior Operating Officer Clerical	Primary Health Care Coordinator Facility Manager

Table 4. Setting and Services Delivered by Study Site (continued)

CHARACTERISTIC		BONNE BAY	CONNAIGRE PENINSULA	TWILLINGATE/ NEW WORLD ISLAND
Primary Health Care Network (defined by site)	Health Care Providers/ Consultants	Nutritionist Occupational Therapist Communicable Disease Nurses Speech Pathologist Audiologist Developmental Psychologist Mental Health Psychologist Community Health Liaison Nurses Reproductive Health Consultant Youth Corrections Consultant Early Childhood Consultant	Dietician Occupational Therapist Physiotherapist Mental Health Social Worker Long Term Care Social Worker Mental Health Nurse Pharmacist Ultrasound Technologist Behavioral Management Specialist Child Management Specialists Other consultants as needed	Dietitian/Nutritionist Occupational Therapist Communicable Disease Nurse Speech Language Pathologist Physiotherapist Psychologist Youth Corrections Social Worker Respiratory Therapist Reproductive Health Nurse Addictions Counselors Lactation Consultant Wound Care Consultant Child Care Services Consultants
	Educators and Program Coordinators	Cervical Screening Regional Coordinator Diabetes Education Nurse Regional Health Educator Parent-Child Health Coordinators Community Supports Regional Coordinator Community Supports Assistant and Placement Coordinator Regional Home Nursing Care Coordinator Addictions Education and Prevention Coordinator	--	Cervical Screening Initiatives Coordinator Health Promotion Coordinator
	Other	Home Support Workers Medical Officer of Health Environmental Health Manager of Health Protection	--	Medical Officer of Health Home Visitors Environmental Health Services Coordinator Financial Assessors

Table 4. Setting and Services Delivered by Study Site (continued)

CHARACTERISTIC	BONNE BAY	CONNAIGRE PENINSULA	TWILLINGATE/ NEW WORLD ISLAND
Services Provided	Ambulatory care Acute care Long-term care Palliative Care 24/7 ER services at main site Public health nursing Diagnostic services Physio/occupational therapy Diabetic services Community Health Nursing Child Youth and Family Services Rehab Services Recreation Therapy Dietetics Chemotherapy Addiction Services Youth Corrections Visiting Specialists -- Social Work Mental Health Services -- -- -- -- -- -- --	Ambulatory care Acute care Long term care Palliative care 24/7 ER services at main site Public health nursing Diagnostic services Physio/occupational therapy Diabetes care Continuing Care Nursing Child Youth and Family Services Family Rehab Services Recreation Therapy Dietetics Chemotherapy Intervention Services Youth Corrections Visiting Specialists Respite care Social Work Mental Health Services Audiology (private) Dental Services After hours 1 800 # -- -- -- --	Ambulatory care Acute care Long-term care Palliative care 24/7 ER services at main site Public health nursing, Diagnostic services Physio/occupational therapy Diabetes care program Continuing Care Child Youth & Family Services Family Rehab Services Recreation Therapy Dietetics Chemotherapy Addictions Services Youth Corrections Visiting Specialists Respite Care Social work -- -- -- -- Diabetes Education Health Promotion/Protection Asthma Care Program Hyperlipidemia Care Program

Table 4. Setting and Services Delivered by Study Site (continued)

CHARACTERISTIC	BONNE BAY	CONNAIGRE PENINSULA	TWILLINGATE/ NEW WORLD ISLAND
Physician Profile	5 positions (4 salaried, 1 fee-for-service); Chief of staff fee-for-service	6 positions (5 salaried, 1 fee-for-service); Chief of staff fee-for-service	8 positions (3 salaried, 1 Fee-for-service, 4 vacant); Senior Medical Officer fee-for-service
Access to Secondary Services	Acute (8) and long term care (14) beds at main site; 125 kms from secondary centre in Corner Brook	Acute (8) and long term care (12) beds at main site; 2.5 hours from regional secondary center in Grand Falls	Acute (17) and long term care (32) beds at main site; 1.5 hrs from regional referral center in Gander

'--' indicates provider or service not identified by site

An important difference among study sites was their level of technical capacity. Two of the study sites, Bonne Bay and Connaigre Peninsula, were similar at the beginning of the primary health care renewal initiative (i.e. had limited technical capacity). While the technical environment at each site was not exactly the same, the level of ICT capacity at each site was similar in that there were: few computers available; limited or no access to existing client data (i.e. clinical and demographic), particularly outside the main site; connectivity to both the Internet and regional Meditech system was slow (i.e. dial-up) at most sites, if available at all; and documentation was almost entirely paper-based, with some electronic documentation by community health staff. The other study site, Twillingate/New World Island, had a high degree of technical capacity at the beginning of the primary health care renewal initiative. Compared to the other two study sites, the Twillingate/New World Island site had a number of computers available to staff either at the point of care or in centralized locations and access to client clinical data (i.e. laboratory orders and results) at each site (i.e. main site and satellite clinic). The main site also had technical capacity for electronic documentation for community health services and in-patient nursing (acute and long term care), videoconferencing and administrative tasks (i.e. registration, scheduling and dictation/transcription). While the Twillingate/New World Island site did not have a complete technical environment that enabled all possible functionalities, it was considered to have a high level of technical capacity and health care providers and staff had been operating in this environment for several years.

Following the enhancement of ICT, the Connaigre Peninsula study site was more similar to the Twillingate/New World Island site with respect to technical capacity.

Again, specific technologies and systems available were not exactly the same at both sites. However, the enhancements at the Connaigre Peninsula site resulted in a primary health care environment that had a level of technical capacity that was more similar to the Twillingate/New World Island site (with a higher level of ICT capacity), than the Bonne Bay site (with minimal ICT capacity).

Presented in Tables 5a-c is a summary of the technical environment at each site before (T1) and after (T2) the primary health care renewal initiative. Only major applications that were relevant to the present study are included. The following terms related to the technical environment are used in Tables 5a-c and/or throughout the report.

Meditech: A vendor purchased hospital information system. A number of modules are available and can be implemented independently or as part of an integrated health information solution, including:

Patient Care Inquiry: Patient Care Inquiry (PCI) provides care providers in a single or multiple facility health care organization access to an integrated display of patient information including demographics and clinical information such as laboratory test orders and results.

Registration: Meditech's Registration module collects registration and admission data on patients throughout a healthcare organization. The Registration module allows appropriate staff to search and define client lists. The Registration module is linked with the provincial Client Registry.

Scheduling: The Scheduling module simplifies the process by which staff at a single or multiple facility health care organization schedule appointments. The functionality automates and streamlines patient appointment scheduling and helps users reduce scheduling errors.

Nursing: Meditech's Nursing application allows both multiple and single facility health care organizations to create standard patient care plans, document assessments and record notes about a patient's progress.

Magic Office: Meditech Magic Office is an internal email/messaging system.

Departmental: The Departmental module offers data processing and reporting capabilities. Departmental reports can include organization-defined data entry screens, "canned" text, free text sections for entering unlimited amounts of data and standard patient data fields, such as a patient's name and age, that automatically default into a report. The Departmental module enables automatic insertion of patient-related demographic or clinical data from other Meditech applications, transcription of dictated material into locally designed formats, development and printing of reports using data available in Meditech applications utilizing organization defined report templates, and electronic

sign off on departmental reports by physicians/other providers using a personal identification number.

Client and Referral Management System (CRMS): The provincial community health information system. It is an integrated system developed locally for the provincial Department of Health and Community Services. The system has ten specific Program Areas and the intended purpose is to register, document and manage the delivery of community based services to clients. Specific Program Areas include Health Promotion and Protection, Continuing Care, Child Youth and Family Services, Community Youth Corrections, Adoptions, Rehabilitation Services, Community Support Services, Child Management, Mental Health, Direct Home Services and Addictions. CRMS is linked with the provincial Client Registry.

Picture Archiving and Communications System (PACS): A provincial electronic, filmless information system for acquiring, sorting, transporting, storing and electronically displaying medical images, such as x-rays and CT scans. The provincial PACS is linked with the provincial Client Registry.

Client Registry: A province wide information system for identifying patients and clients. It is a cross-referenced index of identifiers assigned to patients and clients by the health system, including: MCP; hospital number; file number; and computer generated numbers. The Client Registry assists in timely and accurate identification of individuals at registration for services provided by health

authorities, up-to-date demographics and up-to-date eligibility status for provincial health insurance (MCP).

Broadband: High speed internet connection.

Dial-up: Internet connection over a conventional telephone line. Dial-up has substantially slower speeds than broadband.

Frame Relay: A telecommunication service designed for cost-efficient data transmission between sites in a network via a dedicated connection. Frame relay provides a faster connection than dial-up, but does not provide an external internet connection.

Wireless: Technology that allows two or more computers to communicate, enabling file sharing, printer sharing, internet connection, etc, without the use of network cabling.

Virtual Private Network (VPN): A network that uses the Internet to provide remote offices or individual users with secure access to their organization's network.

As shown in Tables 5a-c, there were changes in ICT at all three study sites between T1 and T2. Enhancements in the Bonne Bay primary health care setting involved a change in connectivity to broadband, enabling high-speed internet access at the main site. Enhancements in the Connaigre Peninsula primary health care setting included the

installation of additional computers at each site, upgraded connectivity at all sites, installation and/or additional access to Meditech at each site including both clinical and administrative modules, increased access to CRMS and PACS, and the implementation of video-conferencing equipment and standard assessment tools. Enhancements in the Twillingate/New World Island primary health care setting included the installation of additional computers and the Meditech registration module at the satellite clinic. In addition, the connectivity at the clinic was upgraded to include high-speed, which in turn enabled access to CRMS and PACS.

Table 5a. Comparison of Technical Environment between T1 and T2, Bonne Bay

SITE	COMPUTERS		CONNECTIVITY	
	T1	T2	T1	T2
Bonne Bay Health Centre, Norris Point (Main Site)	Outpatient nurse has computer (also used by support staff); Computer in ER and outpatients for physicians All community health staff have computers	Outpatient nurse has computer (also used by support staff); Computer in ER and outpatients for physicians All community health staff have computers	Frame relay	Frame relay Broadband
Cow Head (satellite clinic)	1 computer for clerical staff	1 computer for clerical staff	Dial-up	Dial-up
Cow Head (Public Health Nurse)	1 computer	1 computer	Dial-up	Dial-up
Daniel's Harbour (satellite clinic)	--	--	--	--
Parsons Pond (satellite clinic)	--	--	--	--
Woody Point (satellite clinic)	Chief Medical Officer has laptop (also covers Trout River)	Chief Medical Officer has laptop (also covers Trout River)	Dial-up	Dial-up
Woody Point (community health)	All community health staff have computers	All community health staff have computers	Frame relay	Frame relay
Trout River (satellite clinic)	Chief Medical Officer has laptop (also covers Woody Point)	Chief Medical Officer has laptop (also covers Woody Point)	--	--

Table 5a. Comparison of Technical Environment between T1 and T2, Bonne Bay (Continued)

SITE	MEDITECH		CRMS		OTHER	
	T1	T2	T1	T2	T1	T2
Bonne Bay Health Centre, Norris Point (Main Site)	Registration	Registration	All modules, limited utilization	All modules, limited utilization	Community health staff use Microsoft Outlook for appointment scheduling	Community health staff use Microsoft Outlook for appointment scheduling
Cow Head (satellite clinic)	--	--	--	--	--	--
Cow Head (Public Health Nurse)	--	--	--	--	Microsoft Outlook for appointment scheduling	Microsoft Outlook for appointment scheduling
Daniel's Harbour (satellite clinic)	--	--	--	--	--	--
Parsons Pond (satellite clinic)	--	--	--	--	--	--
Woody Point (satellite clinic)	--	--	--	--	--	--
Woody Point (community health)	--	--	All modules, limited utilization	All modules, limited utilization	Microsoft Outlook for appointment scheduling	Microsoft Outlook for appointment scheduling
Trout River (satellite clinic)	--	--	--	--	--	--

Table 5b. Comparison of Technical Environment between T1 and T2, Connaigre Peninsula

SITE	COMPUTERS		CONNECTIVITY	
	T1	T2	T1	T2
Connaigre Peninsula Community Health Centre, Harbour Breton (main site)	Nursing unit (1) Registration (3)	Nursing station (1) Nursing mobile laptops (2) Nursing PDAs (7) Registration (4) Reception (1) All physician offices Outpatients (1) Community health staff mobile computers (3) Training room (4)	Broadband	Broadband Wireless VPN (physicians)
Mose Ambrose (district clinic)	Physician (1) Nurse (1)	Physician (1) Nurse (1) Central (1)	Dial-up	Frame relay Broadband
Hermitage (district clinic)	Physician (1) Nurse (1)	Physician (1) Nurse (1) Central (1)	Dial-up	Frame relay Broadband
Galtous (remote clinic)	--	1 Centrally located	--	Dial-up
Rencontre (remote clinic)	--	1 Centrally located	--	Dial-up
McCallum (remote clinic)	--	1 Centrally located	--	Dial-up

Table 5b. Comparison of Technical Environment between T1 and T2, Connaigre Peninsula (Continued)

SITE	MEDITECH		CRMS		OTHER	
	T1	T2	T1	T2	T1	T2
Connaigre Peninsula Community Health Centre, Harbour Breton (main site)	Registration PCI Magic Office	Registration PCI Magic Office Scheduling Nursing Departmental Meditech access extended to community health staff	All modules	All modules	PACS	PACS Video-conferencing Standard assessment tools (diabetes flow sheet, long-term care MDS)
Mose Ambrose (district clinic)	PCI Magic Office	PCI Magic Office Scheduling, Registration	--	All modules	--	PACS
Hermitage (district clinic)	PCI Magic Office	PCI Magic Office Scheduling, Registration	--	All modules	--	PACS
Galtous (remote clinic)	--	PCI Magic office	--	--	--	--
Rencontre (remote clinic)	--	PCI Magic office	--	--	--	--
McCallum (remote clinic)	--	PCI Magic office	--	--	--	--

Table 5c. Comparison of Technical Environment between T1 and T2, Twillingate/New World Island

SITE	COMPUTERS		CONNECTIVITY	
	T1	T2	T1	T2
Notre Dame Bay Memorial Health Centre, Twillingate (main site)	Computers in some exam rooms All physician offices All registration/ administrative support All community health staff 2 mobile units, inpatient setting Some physicians have personal PDAs Some other clinical staff	Computers in most exam rooms All physician offices All registration/ administrative support All community health staff 2 mobile units, inpatient setting Some physicians have personal PDAs Most other clinical staff including physiotherapist, occupational therapist, nurse practitioners, diabetes nurse, dietitian, speech language pathologist	Broadband	Broadband
New World Island Medical Clinic	Centrally located computers	Centrally located computers available to visiting providers Computers available at point of care to all providers	Dial-up	Fame Relay Broadband

Table 5c. Comparison of Technical Environment between T1 and T2, Twillingate/New World Island (Continued)

SITE	MEDITECH		CRMS		OTHER	
	T1	T2	T1	T2	T1	T2
Notre Dame Bay Memorial Health Centre, Twillingate (Main site)	Registration Scheduling Pharmacy Nursing PCI Departmental Magic Office	Registration Scheduling Pharmacy Nursing PCI Departmental Magic Office	All modules	All modules	PACS Video-conferencing Dictation/ transcription system	PACS Video-conferencing Dictation/ transcription system
New World Island Medical Clinic	PCI Magic Office	PCI Magic Office Registration	--	All modules	--	PACS

'--' indicates no capacity for specified item

4.3 Research Questions

Stakeholder consultations identified three broad areas of interest for the evaluation: 1) benefits, 2) costs and 3) lessons learned. Benefits were anticipated in three major areas including: a) team functioning, b) administrative functioning and c) quality of care. Areas of interest for the evaluation identified in consultation with key stakeholders were formulated into three research questions to address in the evaluation:

1. What are the benefits of the information and communication technology (ICT) enhancements and how to they compare to anticipated benefits?

    a. Does enhancing ICT impact the functioning of primary health care teams?

    b. Does enhancing ICT impact administrative functioning?

    c. Does enhancing ICT impact the quality of care?

2. What were the costs of the ICT enhancements in the Connaigre Peninsula primary health care setting and how do they compare to expected costs?

3. What are the lessons learned that can be used by other primary health care sites engaging in similar initiatives?

Using the research questions as broad areas of focus and building on the findings of the stakeholder consultations, as well as prior evaluations of information systems in

primary health care settings reported in the literature, a list of indicator areas was identified for inclusion in the study (Appendix I).

4.4 Study Instruments

The approach to the evaluation included both quantitative and qualitative methods and primary and secondary data collection strategies. Primary data collection included: a) a survey of primary health care team members, b) key informant interviews, and c) a focus group session. Secondary data collection included: a) the Team Effectiveness/Scope of Practice Survey and b) the Client Satisfaction Survey (both carried out as part of the larger primary health care renewal initiative), and c) a review of existing documentation.

Presented in Table 6 is a summary of the relationship between the research questions and study instruments and the time each instrument was administered (T1 or T2), followed by a description of study instruments.

Table 6. Relationship between Research Questions and Study Instruments

QUESTION	INSTRUMENT(S)	TIME PERIOD
What are the benefits of the ICT enhancements and how to they compare to anticipated benefits?	Primary Health Care Team Survey Focus Group Key informant interviews Team Effectiveness/Scope of Practice Survey Client Satisfaction Survey	T2 T2 T2 T1/T2 T1/T2
What were the costs of the ICT enhancements in the Connaigre Peninsula primary health care setting and how do they compare to expected costs?	Document Review	T1/T2
What are the lessons learned that can be used by other primary health care sites engaging in similar initiatives?	Key informant interviews Focus Group	T2 T2

4.4.1 Primary Health Care Team Survey

A questionnaire (Appendix J) targeting primary health care team members, including network providers and administrative support staff, was developed for the study. Questions were developed based on findings of: 1) the pre-evaluation workshop; 2) the initial information gathering interviews carried out in phase I; and 3) a review of relevant literature. The questionnaire consisted of three sections. In section one, participants were asked to compare their current experiences in primary health care to their experiences before the Primary Health Care renewal initiative using a five-point Likert scale. Section two focused on specific functions that were enabled or enhanced through ICT enhancements in the Connaigre Peninsula site and consisted largely of

multiple choice and Likert scale questions. Section three included questions related to demographics and provided a space for additional comments.

The questionnaire was prepared in two formats, hard copy and electronic (web based). Both the hard copy and web-based electronic questionnaire were pilot tested with four individuals, representing each of the three study sites. Each individual completed the questionnaire and reviewed it for clarity and content relevance. Feedback received was considered valuable and changes were made where applicable. Responses from the four completed questionnaires were included in the data analysis.

4.4.2 Focus Group

A guide (Appendix K) was developed to facilitate a focus group discussion with key individuals involved with the Connaigre Peninsula primary health care ICT enhancement project, as well as key users of the technology. The guide consisted of three open ended questions that were designed to stimulate discussion with respect to: 1) the perceived impact of the ICT enhancements in the three anticipated benefit areas (i.e. team functioning, administrative functioning and quality of care); 2) the implementation process, including what went well and what could have been improved; and 3) any gaps that existed in information and communication capacity after proposed enhancements had been received.

4.4.3 Key Informant Interviews

Key informants included Connaigre Peninsula primary health care team members representing various perspectives, including community health providers, clinical providers and administrative support staff, as well as providers practicing at the main site, district clinics and remote clinics. Key informants also included individuals involved in the ICT enhancement project. The purpose of the key infomant interviews was to explore preliminary focus group and survey findings in greater detail. There was some overlap between focus group participants and key informant interview participants.

An interview guide (Appendix L) was developed for the study. Interview questions focused on: 1) perceived benefits of the ICT enhancements; 2) limitations or gaps with respect to information and communications capabilities; and 3) the implementation process, including lessons learned. All questions were open-ended.

4.4.4 Team Effectiveness/Scope of Practice Survey

As part of an evaluation of the broader primary health care renewal initiative in Newfoundland and Labrador conducted by an independent evaluation team, a two part survey (Appendix M) was administered to primary health care team members. Part A focused on teamwork and included items related to team purpose and vision, communication, team support, partnerships and personal satisfaction. Part B focused on scope of practice issues and included items related to team member roles, service delivery and additional items related to personal satisfaction. All survey items were closed-ended and consisted largely of seven-point Likert scale questions. Definitions of "primary

health care team", "primary health care network" and "physician network", as well as a team membership list, were distributed along with the survey to help ensure a consistent understanding of team composition among team members.

4.4.5 Client Satisfaction Survey

Also part of the broader primary health care renewal evaluation, a structured telephone survey (Appendix N) was carried out with a random sample of adults (age 18 years and older) living within the catchment area of each primary health care site in Newfoundland and Labrador. Survey items addressed primary health care services used, experiences with accessing primary health care services and demographics. The interview included a combination of question types including multiple choice, Likert scale and open ended questions.

4.4.6 Review of Existing Documents

As part of the management of the ICT enhancement project in the Connaigre Peninsula primary health care site, information related to technical enhancements and associated costs were documented. Relevant documents included the funding proposal submitted to the Office of Primary Health Care and the Newfoundland and Labrador Centre for Health Information (which itemizes the proposed ICT enhancements for the Connaigre Peninsula primary health care site), as well as invoices and status reports submitted for reimbursement. A data collection form (Appendix O) was developed to aid

in data extraction and included space to collect information related to expected and actual costs. Costs were separated into equipment costs and human resource costs.

4.5 Data Collection

4.5.1 Primary Health Care Team Survey

A list of all primary health care team members, along with mailing addresses, was obtained from each of the three study sites. At the end of June 2006, survey packages were distributed by mail to the three study sites (Bonne Bay = 43, Connaigre Peninsula = 72, Twillingate/New World Island = 128). Each survey package contained a cover letter (Appendix P) that explained the purpose of the survey and offered a web address to an electronic version of the survey, as well as a hard copy survey and a pre-addressed, stamped return envelope. In late September 2006, a second survey package was mailed to all primary health care team members in an effort to maximize the response rate. The second mail-out was delayed until the fall as it was thought to be unfavorable to re-send the survey package during the summer months, a time when many individuals may have been on vacation. In addition, there was knowledge of other surveys being administered to the same target group during the summer months. Primary Health Care Coordinators at each site were asked to encourage staff to complete and return the survey. All completed questionnaires that were returned as of December 31, 2006 were included in the data analysis.

4.5.2 Focus Group

A focus group was held on July 4, 2006 in Harbour Breton, Connaigre Peninsula. Participants included key individuals that were responsible for the ICT enhancement project, as well as key users of the technology. The focus group took place following a previously arranged meeting where status updates were given on the broader primary health care renewal initiative and the ICT enhancement project. Sixteen potential participants were in attendance at the meeting. Meeting participants were notified prior to the meeting that a focus group session would take place and the session was included as the final agenda item.

At the beginning of the session, a brief overview of the study was given and written consent (Appendix Q) to participate in the study was obtained from all participants. Three open-ended questions were posed to guide the discussion and the session was audio-taped. The focus group lasted approximately 45 minutes in duration.

4.5.3 Key Informant Interviews

Telephone interviews were conducted between September 2006 and March 2007, after all technical enhancements had been received. Interviews were requested of 13 individuals including individuals that were responsible for the ICT enhancement project, as well as key members of the primary health care team and users of the technology. Numerous attempts were made, employing a variety of methods (i.e. telephone, email, fax and third-party referral/contact), to recruit a physician(s) to participate in an interview.

Initial contact with potential key informants was made via email (Appendix R) to introduce the study and inform them that they would be contacted by telephone to ask for their participation in the study. Approximately one week following initial email contact, potential key informants were contacted by telephone and asked for their participation in the study (Appendix S). If a key informant agreed to participate, an interview was scheduled to take place at a later date.

At the time of the interview, key informants were contacted by telephone (Appendix T), the purpose of the study was explained, confidentiality was assured and the key informant was notified that a research assistant was present to aid in taking notes during the interview. Notes were taken during the interview by the investigator, who was also conducting the interview, as well as by the research assistant, and typed directly following completion of the interview to improve legibility. Where possible, efforts were made to record exact quotes. Interviews lasted between 45 and 75 minutes.

4.5.4 Document Review

Data collection related to expected and actual costs occurred throughout the duration of the evaluation as new documentation became available. Documents were manually reviewed by the investigator and information was recorded in the data collection form (Appendix O).

4.5.5 Team Effectiveness/Scope of Practice Survey

The questionnaire was administered by an independent evaluation team as part of a broader evaluation of the primary health care renewal initiative in Newfoundland and Labrador. The survey was administered at three time points to primary health care team members in each primary health care site across the province. Data collection points corresponded to before the primary health care renewal initiative, a mid-point assessment and the conclusion of the formal primary health care renewal initiative. As the timing of implementation was different for each primary health care site, the three data collection points varied across sites to correspond to progress at respective sites. At each data collection point, questionnaires were distributed to primary health care team members in hard copy along with a pre-addressed, stamped envelope.

As the broader evaluation of the primary health care renewal initiative was conceived and conducted independent of the current study, approval to access data collected through the Team Effectiveness/Scope of Practice Survey for the three study sites was obtained in writing from the provincial Office of Primary Health Care (Appendix U), who was responsible for the broader primary health care renewal evaluation. All ICT enhancements at the Connaigre Peninsula primary health care site occurred between the initial and final data collection point. As such, data extracted for inclusion in the present study was collected before the primary health care renewal initiative (T1) and at the conclusion of the formal primary health care renewal initiative (T2). Record level data for survey items that were relevant to the present study was received in electronic format.

4.5.6 Client Satisfaction Survey

Telephone surveys were conducted by the Newfoundland and Labrador Centre for Health Information on behalf of the Office of Primary Health Care, as part of the broader evaluation of the primary health care renewal initiative in Newfoundland and Labrador. Surveys were carried out at two time points using a random digit dialing technique. The required sample size for each primary health care site was pre-determined by the evaluators. Individuals were asked to participate in the survey if they were 18 years of age or older and used primary health care services within the past 12 months. Data collection points corresponded to early during the primary health care renewal initiative (T1) and late during the primary health care renewal initiative (T2) at each site.

Approval to access data collected through the Client Satisfaction Survey for the three study sites was obtained in writing from the provincial Office of Primary Health Care (Appendix U). A majority of the ICT enhancements at the Connaigre Peninsula primary health care site occurred between T1 and T2. Record level data for survey items that were relevant to the present study was received in electronic format.

4.6 Data Analysis

Quantitative data were analyzed using the Statistical Package for the Social Sciences (version 15) and presented using descriptive statistics including frequencies, percentages and means. For groups of survey items in which the number of respondents was very small (≤ 5) for some items, frequencies only are presented. For Likert scale items, positive responses (i.e. greater than neutral/middle response) were grouped and

presented as "percent agree". While a chi-square test for 2 X 3 contingency tables could be carried out to compare the three sites, bivariate comparisons were made between Connaigre and Bonne Bay and between Connaigre Peninsula and Twillingate/New World Island, as Connaigre Peninsula was similar to Bonne Bay at T1 and similar to Twillingate/New World Island at T2. Where sample size was greater than or equal to 30, Pearson's chi-square test was used to test for association between survey item and site. Fisher's exact test was used where sample size was less than thirty or any expected cell count was less than 5. Results were considered significant where $p < 0.05$. It was not possible to carry out statistical comparisons between T1 and T2 (within sites) for the Team Effectiveness/Scope of Practice Survey or the Client satisfaction Survey as groups were neither independent nor completely dependent.

A thematic content analysis was conducted for qualitative data, as described by Crabtree and Miller (1999). A coding manual was developed and used to code the text. Codes were based on themes that were decided upon prior to analysis, which were driven by the research questions, identified indicator areas and questions used within the focus group and interview discussion guides. The analysis was largely deductive in nature, as its focus was on organizing transcript data into pre-defined codes. However, further codes were added based on sub-themes that emerged from the data.

4.7 Knowledge Transfer

A knowledge transfer plan was developed that goes beyond passive diffusion of research findings by extracting actionable messages, tailoring them to specific audiences

and presenting them in a form that will be useful in planning and decision-making. The knowledge transfer plan is presented in Appendix V.

4.8 Ethical Considerations

Approval to carry out phase II of the study was granted by the Human Investigation Committee (HIC) of Memorial University of Newfoundland on November 17, 2005, followed by approval of four amendments on May 19, 2006, June 29, 2006, July 5, 2006 and August 4, 2006 (Appendix W). Focus group participants provided express consent to participate in the study by signing a consent form; key informants and survey respondents implied consent by verbally agreeing to participate in a telephone interview or by returning a completed questionnaire. Electronic data files were stored on password protected computer files, and paper data records in a locked filling cabinet, in a secure area of the Newfoundland and Labrador Centre for Health Information (NLCHI). Study data will be retained for five years after the study is complete.

5. RESULTS

Findings for phase I were presented previously in Chapter 4 as the evaluation protocol. Findings for Phase II are presented below according to study instrument. Study instruments used in Phase II included: 1) Primary Health Care Team Survey, 2) Team Effectiveness/Scope of Practice Survey, 3) Client Satisfaction Survey, 4) focus group session 5) key informant interviews and 6) a review of existing documentation.

For ease of presentation, survey data collected before or early during the primary health care renewal initiative is presented as T1, denoting time period one, and data collected at the end or late in the primary health care renewal initiative is presented as T2, denoting time period two. "BB", "CP" and "T/NWI" are used to represent Bonne Bay, Connaigre Peninsula and Twillingate/New World Island, respectively.

Where possible, comparisons are made between results for the Connaigre Peninsula site (received technical enhancements) and the Bonne Bay site (minimal technical capacity) and between the Connaigre Peninsula and the Twillingate/New World Island sites (high degree of technical capacity), as well as within each site over time (T1 to T2). As there were few statistically significant differences between sites, only frequencies and percentages are presented in Chapter 5; results of statistical significance tests are presented in Appendix X. Given the overlap in participants and similarity in findings, focus group and interview data are combined and presented according to themes, along with significant quotes from focus group findings.

5.1 Primary Health Care Team Survey

The Primary Health Care Team Survey was carried out at the end of the primary health care renewal initiative only (T2).

5.1.1 Characteristics of the Sample

Table 7 presents a summary of the sample characteristics by study site. A total of 76 individuals responded to the survey. Following the second survey mail-out, the response rate was 39.5% (17/43), 41.7% (30/72) and 22.7% (29/128) for Bonne Bay, Connaigre Peninsula and Twillingate/New World Island, respectively. A majority of respondents from each site were 40-49 years of age. Approximately 80% of respondents from Connaigre Peninsula and Twillingate/New World Island were female, compared to 93.8% of respondents from Bonne Bay. Approximately 90% of respondents from each site indicated that they use a computer at home.

The distribution of respondents by position type varied somewhat among sites, with a majority of respondents from Connaigre and Twillingate/New World Island indicating that they were in a clinical position (including registered nurse, nurse practitioner, LPN and physician); a majority of Bonne Bay respondents indicated "other" as their position type. As no respondent who indicated "other" specified their position type, it was not possible to provide further breakdown. Only Twillingate/New World Island respondents included physicians (n = 4, data not shown). Community health providers, including community health nurses and social workers, accounted for 25.0%, 17.9% and 7.7% of Bonne Bay, Connaigre Peninsula and Twillingate/New World Island

respondents, respectively. Few respondents from Connaigre Peninsula (10.7%) and Twillingate/New World Island (15.4%) indicated that they were in an administrative support role; no respondent from Bonne Bay indicated that role. Sixty two percent (62.1%) of respondents from Bonne Bay were in their current position for 10 or more years, compared to 55.5% of Connaigre Peninsula respondents and 48.1% of Twillingate/New World Island respondents.

Table 7. Sample Characteristics by Site, Primary Health Care Team Survey

CHARACTERISTIC		BB	CP	T/NWI
Age group (%)	n	16	28	27
	<30	18.8	10.7	3.7
	30-39	12.5	32.1	29.6
	40-49	56.3	42.9	44.4
	50-59	12.5	14.3	18.5
	60+	0	0	3.7
Sex (%)	n	16	28	29
	Male	6.3	21.4	20.7
	Female	93.8	78.6	79.3
Position Type (%)	n	16	28	26
	Admin Support	0	10.7	15.4
	Clinical	6.3	50.0	38.5
	Community Health	25.0	17.9	7.7
	Managerial	6.3	0	3.8
	Other	62.5	21.4	34.6
Years in position (%)	n	16	27	27
	<2	18.8	0	3.7
	2-4	6.3	14.8	18.5
	5-9	12.5	29.6	29.6
	10-19	43.8	29.6	22.2
	20+	18.8	25.9	25.9
Computer at home (%)	n	16	29	28
	Yes	93.8	89.7	89.3

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.1.2 Comparison Before and After the Primary Health Care Renewal Initiative

Section A of the survey asked respondents to compare their current experiences in primary health care with their experiences before the primary health care renewal initiative and indicate the extent to which they agreed or disagreed with a series of statements, focusing on three areas: i) team functioning, ii) quality of care and iii) administrative functioning (Tables 8 – 10).

5.1.2.1 *Team Functioning*

As shown in Table 8, a majority of Connaigre Peninsula and Twillingate/New World Island respondents agreed that communication (63.3% and 60.0%, respectively) and coordination of care (60.0% and 58.3%, respectively) with providers within their primary health care team had improved compared to before the primary health care initiative. Just over half (51.7%) of respondents from Connaigre Peninsula also agreed that coordination of client care with providers outside their primary health care team improved. Fifty-two percent of respondents from Twillingate/New World Island agreed that they have more information about client visits to other providers within their primary health care team, compared to 25.9% from Connaigre Peninsula. A small percentage of respondents from each site agreed that referral documents are more complete or that they had more information on client visits outside their primary health care team. Less than half (11.1 – 43.8%) of Bonne Bay respondents agreed that there were improvements in items related to team functioning following the primary health care initiative. There were no statistically significant differences for items related to team functioning between sites.

Table 8. Team Functioning by Site, Percent Agree

STATEMENT	SITE					
	BB		CP		T/NWI	
	%	n	%	n	%	n
Communication with other providers within my PHC team has improved	43.8	16	63.3	30	60.0	25
Communication with other providers outside my PHC team has improved	31.3	16	43.3	30	45.8	24
Coordination of client care with providers within my PHC Team has improved	40.0	15	60.0	30	58.3	24
Coordination of client care with providers outside my PHC Team has improved	40.0	15	51.7	29	45.8	24
Referral documents (that you compile and/or receive) are more complete	11.1	9	29.6	27	38.1	21
I have more information about my clients' visits to providers within my PHC Team	20.0	10	25.9	27	52.4	21
I have more information about my clients' visits to providers outside my PHC Team	40.0	10	18.5	27	35.0	20

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.1.2.2 *Quality of Care*

As shown in Table 9, a majority of respondents from Connaigre Peninsula responded positively (i.e. agreed that there were improvements) to four of the twelve statements related to quality of care: 60.0% agreed that they have more information on individual clients; 50.0% agreed that they are better able to make decisions about client care; 57.7% agreed that they are able to act on test results in a more timely fashion; and 59.3% agreed that they are better able to adhere to clinical practice guidelines. For other items related to quality of care, less than half (28.6 – 48.3%) of Connaigre Peninsula respondents responded positively. Among Twillingate/New World Island respondents, fifty percent agreed that clients seem more satisfied with the care they receive and that the quality of client-provider interactions improved following the primary health care initiative. Less than half (27.8 - 45.5%) of Twillingate/New World Island respondents responded positively to other items related to quality of care. Few Bonne Bay respondents (10.0 – 33.3%) responded positively to statements related to improvements in quality of care. Compared to Bonne Bay, a significantly higher percentage of respondents from Connaigre Peninsula agreed that they are able to act on test results in a more timely fashion (10.0% vs 57.7%, $p = 0.022$) and they are better able to adhere to clinical practice guidelines (10.0% vs 59.3%, $p = 0.010$) following the primary health care initiative. There were no further statistically significant differences between sites.

Table 9. Quality of Care by Site, Percent Agree

STATEMENT	SITE					
	BB		CP		T/NWI	
	%	n	%	n	%	n
I have more information on individual clients	33.3	9	60.0	30	45.5	22
I have more information on the population to which I deliver care as a whole	25.0	16	34.4	29	38.1	21
I have a more complete client chart	22.2	9	39.3	28	40.9	22
The timeliness of referrals has improved	11.1	9	41.3	29	40.0	20
I have all information about my clients that is important to their care	20.0	10	48.3	29	30.4	23
Clients seem more satisfied with the care they receive	20.0	10	30.0	30	50.0	22
I am better able to make decisions about client care	20.0	10	50.0	30	36.4	22
Patient/client safety has improved	9.1	11	43.3	30	37.5	24
I am able to act on test results in a more timely fashion	10.0	10	57.7	26	35.0	20
The quality of client-provider interactions has improved	22.2	9	41.4	29	50.0	22
In-office/clinic wait time has decreased	11.1	9	28.6	28	27.8	18
I am better able to adhere to clinical practice guidelines	10.0	10	59.3	27	38.1	21

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.1.2.3 *Administrative Functioning*

For items related to administrative functioning (Table 10), a majority of individuals from Connaigre Peninsula responded positively to two of the eight items: 50.0% agreed that they spend less time locating client information and 55.6% agreed that there is less duplication of testing following the primary health care initiative. Nearly half agreed that they have less unfinished work at the end of the workday (46.4%) and security of client information had improved (46.4%). A majority (50.0%) of respondents from Twillingate/New World Island agreed that they see more clients per day following the primary health care initiative. Less than half (26.3 – 40.9%) of respondents from Twillingate/New World Island responded positively to other items related to administrative functioning. Few respondents from Bonne Bay (0 – 12.5%) responded positively to items related to administrative functioning. Compared to Bonne Bay, a significantly higher percentage of respondents from Connaigre Peninsula agreed that they spend less time locating client information (10.0% vs 50.0%, $p = 0.032$), they have less unfinished work at the end of the workday (6.7% vs 46.4%, $p = 0.015$) and that there is less duplication of testing (0% vs 55.6%, $p = 0.002$) following the primary health care renewal initiative. There were no further statistical differences between sites.

Table 10. Administrative Functioning by Site, Percent Agree

STATEMENT	SITE					
	BB		CP		T/NWI	
	%	n	%	n	%	n
The quality of my workday has improved	12.5	16	40.0	30	34.8	23
I see more clients per day	0.0	9	24.1	29	50.0	18
I spend less time locating client information	10.0	10	50.0	30	34.8	23
I have less unfinished work at the end of the workday	6.7	15	46.4	28	39.1	23
There is less duplication of testing	0.0	10	55.6	27	26.3	19
The security of client information has improved	10.0	10	46.4	28	40.9	22
There is less duplication of data collection	0.0	12	23.3	30	36.4	22
I save time on specific tasks throughout the day	10.0	10	29.6	27	27.3	22
I spend more time on specific tasks throughout the day	10.0	10	32.1	28	40.9	22

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.1.3 Specific Functions

For technology-enabled functions that were relevant to their position, participants were asked to indicate the extent to which they agreed or disagreed with a series of statements relating to their satisfaction with the technology and its impact. Specific functions included: a) charting, b) appointment scheduling, c) registration/search and define client lists, d) laboratory results look-up, e) diagnostic imaging look-up, f) messaging, g) videoconferencing and h) standard assessment tools (diabetes flow sheet). For most items related to user satisfaction and impact, the number of respondents from Bonne Bay is very small (≤ 5); this is not unexpected as items related to user satisfaction and impact would not be applicable where the function is not available.

5.1.3.1 *Charting*

As shown in Table 11, less than half of Connaigre Peninsula respondents agreed that training specific to charting was sufficient (7/16) and that system downtime was non-disruptive to workflow (5/15), while a majority agreed that technical support is adequate (10 /16), system performance is adequate (10/16), system downtime is acceptable (10/16), it's easy to use (12/16), they have adequate access (14/16) and it meets their needs (10/15). Six (6) of 15 Connaigre Peninsula respondents indicated that, if given the choice, they would return to the old way of working. A majority of Twillingate/New World Island respondents responded positively to all but one statement; seven out of sixteen agreed that system down-time is non-disruptive to workflow. Few respondents (2/17) indicated that they would return to the old way of working if given the choice. For

all but one statement, respondents from Bonne Bay had a negative response. Two out of four Bonne Bay respondents who indicated that charting was relevant to their role as a primary health care team member indicated that they would return to the old way of working if given the choice.

The proportion of Connaigre Peninsula respondents who agreed that the charting function is easy to use was significantly higher compared to Bonne Bay (12/16 vs 0/4, $p = 0.014$). Similarly, compared to Bonne Bay respondents, a higher proportion of Connaigre Peninsula respondents agreed that the function meets their needs (0/4 vs 10/15, $p = 0.033$). There were no statistically significant differences between Connaigre and Twillingate/New World Island responses.

Also shown in Table 11, a majority of Connaigre Peninsula and Twillingate/New World Island respondents agreed that electronic charting has a positive impact on team functioning, coordination of care and administrative functioning/workflow. However, there were no statistically significant differences between sites.

Table 11. User Satisfaction and Perceived Impact by Site, Charting, Number of Respondents who Agree

AREA	STATEMENT	SITE					
		BB		CP		T/NWI	
		x	n	x	n	x	n
Satisfaction	Training sufficient	1	4	7	16	11	17
	Technical support adequate	1	4	10	16	10	17
	System performance adequate	0	0	10	16	9	17
	System downtime acceptable	0	4	10	16	9	16
	System downtime non-disruptive	0	4	5	15	7	16
	Easy to use	0	4	12	16	13	17
	Adequate access	2	4	14	16	11	17
	Meets needs	0	4	10	15	13	17
	Would return to old way of working	2	4	6	15	2	17
Positive Impact	Team functioning	0	0	11	16	12	17
	Coordination of care	1	3	11	16	11	17
	Administrative functioning/workflow	1	3	11	16	10	15

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

5.1.3.2 *Scheduling*

As shown in Table 12, less than half of Connaigre Peninsula respondents who have access to the technology-enabled scheduling function agreed that training specific to that function was sufficient (2/5), system performance is adequate (2/5) and that downtime is acceptable (1/5) and non-disruptive to workflow (1/4). However, a majority agreed that technical support is adequate (3/5), it's easy to use (3/5), they have adequate access (4/5) and it meets their needs (3/5). No Connaigre Peninsula respondent indicated that they would return to the old way of working if given the choice. With the exception of one statement, system downtime is non-disruptive to workflow, Twillingate/New World Island primary health care team members responded positively to all statements related to the technology-enabled scheduling function. Only one individual from Bonne Bay responded to items related to the scheduling function. A majority of respondents from each site agreed that technology-enabled scheduling has a positive impact on team functioning, coordination of care and administrative functioning/workflow. There were no statistically significant differences between sites.

Table 12. User Satisfaction and Perceived Impact by Site, Scheduling, Number of Respondents who Agree

AREA	STATEMENT	SITE					
		BB		CP		T/NWI	
		x	n	x	n	x	n
Satisfaction	Training sufficient	1	1	2	5	6	7
	Technical support adequate	1	1	3	5	6	7
	System performance adequate	1	1	2	5	5	7
	System downtime acceptable	0	1	1	5	4	7
	System downtime non-disruptive	0	1	1	4	1	7
	Easy to use	1	1	3	5	7	7
	Adequate access	1	1	4	5	7	7
	Meets needs	1	1	3	5	6	6
	Would return to old way of working	0	1	0	5	2	6
Positive Impact	Team functioning	1	1	3	5	6	6
	Coordination of care	1	1	4	5	4	6
	Administrative functioning/workflow	1	1	4	5	6	6

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

5.1.3.3 *Registration/Search and Define*

With respect to the technology-enabled registration functioning (Table 13), a majority of respondents from each site agreed that training was sufficient, technical support is adequate and system performance is adequate. A majority from each site also agreed that it is easy to use, they have adequate access and it meets their needs. Less than half of Connaigre Peninsula respondents agreed that system downtime is acceptable and is non-disruptive to workflow (6/16 and 4/15, respectively). A small number of Connaigre Peninsula (2/15) and Twillingate/New World Island (3/15) respondents indicated that they would return to the old way of working if given the choice. A majority of respondents from each site agreed that the technology-enabled registration function and/or the ability to search and define client lists has a positive impact on team functioning, coordination of care and administrative functioning/workflow. Only two individuals from Bonne Bay responded to items related to the registration function. There were no statistically significant differences between sites.

Table 13. User Satisfaction and Perceived Impact by Site, Registration/Search and Define, Number of Respondents who Agree

AREA	STATEMENT	SITE					
		BB		CP		T/NWI	
		x	n	x	n	x	n
Satisfaction	Training sufficient	1	2	11	15	9	13
	Technical support adequate	2	2	12	16	10	13
	System performance adequate	1	2	9	16	10	13
	System downtime acceptable	1	2	6	16	9	13
	System downtime non-disruptive	1	2	4	15	6	13
	Easy to use	1	2	12	16	9	14
	Adequate access	2	2	14	16	10	14
	Meets needs	1	2	10	15	10	14
	Would return to old way of working	0	2	2	15	3	14
Positive Impact	Team functioning	1	2	12	16	10	14
	Coordination of care	2	2	13	16	12	14
	Administrative functioning/workflow	2	2	12	16	11	12

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

5.1.3.4 *Laboratory Results Look-up*

As presented in Table 14, a majority of participants from each site responded positively to statements relating to satisfaction with the technology-enabled laboratory results look-up function. Connaigre Peninsula and Twillingate/New World Island respondents were least satisfied with respect to system downtime. A large majority of Connaigre Peninsula (20/23) and Twillingate/New World Island (15/17) respondents agreed that the function meets their needs; a small number (2/23 and 3/16, respectively) indicated that they would return to the old way of working if given the choice. While the proportion of respondents who agreed with statements related to satisfaction with the laboratory results look-up function was generally lower for Bonne Bay, there were no statistically significant differences between sites. A large majority of respondents from each site agreed that the ability to view laboratory results electronically has a positive impact on team functioning, coordination of care and administrative functioning/workflow. There were no statistically significant differences between sites.

Table 14. User Satisfaction and Perceived Impact by Site, Laboratory Results Look-up, Number of Respondents who Agree

AREA	STATEMENT	SITE					
		BB		CP		T/NWI	
		x	n	x	n	x	n
Satisfaction	Training sufficient	1	2	16	22	13	17
	Technical support adequate	1	2	17	23	15	17
	System performance adequate	1	2	19	23	15	17
	System downtime acceptable	1	2	12	22	11	16
	System downtime non-disruptive	1	1	11	22	9	16
	Easy to use	1	2	20	23	16	17
	Adequate access	1	2	21	23	16	17
	Meets needs	1	2	20	23	15	17
	Would return to old way of working	0	2	2	23	3	16
Positive Impact	Team functioning	2	2	22	23	15	17
	Coordination of care	2	2	22	23	16	17
	Administrative functioning/workflow	1	1	21	23	12	15

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

5.1.3.5 *Digital Imaging Look-up*

With the exception of "system downtime is non-disruptive to workflow", a majority of respondents from Connaigre Peninsula and Twillingate/New World Island responded positively to statements related to their satisfaction with this technology-enabled function. For some aspects, all Connaigre Peninsula and Twillingate/New World Island respondents indicated that they were satisfied. No Connaigre Peninsula respondent indicated that they would return to the old way of working if given the choice. All Connaigre and Twillingate/New World Island respondents agreed that the ability to view digital images has a positive impact on team functioning, coordination of care and administrative functioning/workflow (Table 15). There were no statistically significant differences for any item.

Table 15. User Satisfaction and Perceived Impact by Site, Digital Imaging Look-up, Number of respondents who Agree

AREA	STATEMENT	SITE					
		BB		CP		T/NWI	
		x	n	x	n	x	n
Satisfaction	Training sufficient	0	2	2	3	5	7
	Technical support adequate	0	2	2	3	7	7
	System performance adequate	1	2	3	3	7	7
	System downtime acceptable	1	2	3	3	6	7
	System downtime non-disruptive	1	2	1	3	5	7
	Easy to use	1	2	3	3	5	7
	Adequate access	1	2	2	3	7	7
	Meets needs	1	2	3	3	7	7
	Would return to old way of working	1	2	0	3	1	7
Positive Impact	Team functioning	1	2	3	3	7	7
	Coordination of care	1	2	3	3	7	7
	Administrative functioning/workflow	0	1	3	3	6	6

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

5.1.3.6 *Messaging*

A majority of respondents from each site responded positively to statements related to their satisfaction with the technology-enabled messaging function, with the exception of training where 36.4 % of Bonne Bay primary health care team members responded positively. A small number (8.7%) of Connaigre Peninsula respondents indicated that they would return to the old way of working if given the choice; the percentage for Bonne Bay and Twillingate/New World Island was 0% and 22.2%, respectively. A majority of respondents from each site agreed that electronic messaging has a positive impact on team functioning, coordination of care and administrative functioning/workflow (Table 16). Although percentages were somewhat lower for Bonne Bay, differences between sites were not significantly significant.

Table 16. User Satisfaction and Perceived Impact by Site, Messaging, Percent Agree

AREA	STATEMENT	SITE					
		BB		CP		T/NWI	
		%	n	%	n	%	n
Satisfaction	Training sufficient	36.4	11	62.5	24	77.8	27
	Technical support adequate	50.0	12	75.0	24	75.0	28
	System performance adequate	66.7	12	76.0	25	78.6	28
	System downtime acceptable	58.3	12	52.0	25	51.9	27
	System downtime non-disruptive	58.3	12	50.0	24	51.9	27
	Easy to use	58.3	12	88.0	25	92.9	28
	Adequate access	83.3	12	88.0	25	82.1	28
	Meets needs	75.0	12	76.0	25	89.3	28
	Would return to old way of working	0	9	8.7	23	22.2	27
Positive Impact	Team functioning	75.0	12	84.0	25	85.2	27
	Coordination of care	55.6	9	80.0	25	88.5	26
	Administrative functioning/workflow	50.0	10	69.6	23	85.2	27

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.1.3.7 *Videoconferencing*

With the exception of having adequate access, less than half of Connaigre Peninsula primary health care team members responded positively to statements related to satisfaction with videoconferencing capabilities (Table 17). However, only two out of ten respondents agreed that they would return to the old way of working if given the choice. Results related to satisfaction with videoconferencing were similar for Connaigre Peninsula and Twillingate/New World Island. A majority of Connaigre Peninsula respondents agreed that videoconferencing has a positive impact on team functioning, coordination of care and administrative functioning/workflow. Compared to Connaigre, the proportion from both Bonne Bay and Twillingate/NWI who agreed with statements related to the impact of videoconferencing was somewhat lower; the difference between Connaigre and Bonne Bay was statistically significant ($p < 0.05$) for each item related to impact.

Table 17. User Satisfaction and Perceived Impact by Site, Videoconferencing, Number of Respondents who Agree

AREA	STATEMENT	SITE					
		BB		CP		T/NWI	
		x	n	x	n	x	n
Satisfaction	Training sufficient	0	7	1	12	3	16
	Technical support adequate	1	7	4	12	6	18
	System performance adequate	1	7	5	11	7	19
	System downtime acceptable	1	4	4	10	7	18
	System downtime non-disruptive	0	4	4	10	7	18
	Easy to use	0	6	4	11	7	18
	Adequate access	0	7	7	11	9	18
	Meets needs	0	5	5	11	10	18
	Would return to old way of working	1	6	2	10	7	19
Positive Impact	Team functioning	1	5	9	11	11	19
	Coordination of care	0	3	9	11	10	18
	Administrative functioning/workflow	0	5	7	11	7	15

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

5.1.3.8 *Standard Assessment Tools (Diabetes Flow-sheet)*

As shown in Table 18, the number of Connaigre Peninsula respondents that responded favourably to statements related to satisfaction with the technology-enabled standard assessment tool (i.e. diabetes flow-sheet) varied among items. One third or less agreed that training was sufficient, system downtime is acceptable and non-disruptive to workflow and that it is easy to use. However, at least two-thirds agreed that technical support is adequate, system performance is adequate and that they have adequate access. Five out of six agreed that it meets their needs and three out of six agreed that they would return to the old way of working if given the choice. Five out of six Connaigre Peninsula respondents agreed that the diabetes flow sheet has a positive impact on each of team functioning, coordination of care and administrative functioning/workflow. Twillingate/New World Island and Bonne Bay primary health care team members did not have access to the technology-enabled diabetes flow sheet.

Table 18. User Satisfaction and Perceived Impact, Connaigre Peninsula, Standard Assessment Tool (Diabetes Flow Sheet), Number of Respondents who Agree

AREA	STATEMENT	CP	
		x	n
Satisfaction	Training sufficient	2	6
	Technical support adequate	5	6
	System performance adequate	4	6
	System downtime acceptable	2	6
	System downtime non-disruptive	1	5
	Easy to use	2	6
	Adequate access	4	6
	Meets needs	5	6
	Would return to old way of working	3	6
Positive Impact	Team functioning	5	6
	Coordination of care	5	6
	Administrative functioning/workflow	5	6

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

5.1.4 Benefit-to-Effort

In addition to examining satisfaction with and impact of specific technology-enabled functions, primary health care team members were asked to rate the overall benefit of each function, as well as the effort required to use each function, on a scale of one to ten, with 1 being very little benefit/effort and 10 being a great deal of benefit/effort. In general, benefit (B) scores for Connaigre Peninsula were somewhat higher than for Bonne Bay and slightly lower than for Twillingate/New World Island. Similarly, effort (E) scores were generally lower for Connaigre Peninsula than those for Bonne Bay, and slightly higher than those for Twillingate/New World Island. For Connaigre Peninsula and Twillingate/New world Island, the benefit-to-effort ratio (B:E) for all functions is greater than one; ratios are higher for Twillingate/New World Island. For Bonne Bay, benefit to effort ratios are less than or slightly greater than one for most functions. Overall, benefit-to-effort ratios are highest for electronic messaging, laboratory results look-up and registration/client lists and lowest for videoconferencing and the diabetes flow sheet standard assessment tool (Table 19).

Table 19. Benefit and Effort Scores by Site

FUNCTION	BONNE BAY			CONNAIGRE PENINSULA			TWILLINGATE/ NEW WORLD ISLAND		
	B	E	B:E	B	E	B:E	B	E	B:E
Charting	3.00	7.75	0.43	7.13	4.81	2.16	8.35	3.29	5.15
Scheduling	7.00	4.00	1.75	8.00	4.80	2.22	8.63	4.13	4.85
Registration/Client Lists	6.50	6.50	1.02	7.81	4.13	3.14	8.00	3.14	5.42
Laboratory results look-up	6.50	6.50	1.00	8.41	3.41	3.91	8.88	3.18	4.98
Digital Imaging	6.50	5.50	1.25	9.33	4.67	3.33	9.00	4.71	3.61
Messaging	7.75	2.75	4.89	7.92	3.46	4.42	8.54	2.82	5.78
Videoconferencing	6.43	6.71	0.96	6.46	5.85	1.49	6.47	6.00	2.23
Diabetes Flow Sheet	--	--	--	6.33	5.00	1.69	--	--	--

Note: Benefit-to-Effort Ratio (B:E) = the average of the individual ratios of benefit/effort provided by respondents, not the ratio of the average benefit and effort scores.

5.2 Team Effectiveness/Scope of Practice Survey

5.2.1 Characteristics of the Sample

As previously noted, this questionnaire was administered by an independent team as part of an evaluation of the larger primary health care renewal initiative in Newfoundland and Labrador. Data was obtained for a total of 169 completed surveys. As shown in Table 20, response rates for T1 were 42.9% (18/42), 62.9% (39/62) and 26.8% (33/123) for Bonne Bay, Connaigre Peninsula and Twillingate/New World Island, respectively. Response rates for T2 were 33.3% (14/42), 45.2% (28/62) and 30.1% (37/123), respectively. Mean age was slightly higher at T2 for all sites, with the exception of Twillingate/New World Island. For each site and time period, a majority of respondents indicated their current position as nurse or "other", including a range of positions such as dietitian, health educator, laboratory/diagnostic imaging technician, respiratory therapist, occupational therapist, physiotherapist, midwife, pharmacist and paramedic. A majority of respondents indicated that they were a member of the primary health care team at their site. In T1 and T2, Bonne Bay had a higher percentage of respondents who were network providers (approximately 45%), compared to Connaigre Peninsula and Twillingate/New World Island (5-18%).

Table 20. Sample Characteristics, Team Effectiveness/Scope of Practice Survey

CHARACTERITIC		BONNE BAY		CONNAIGRE PENINSULA		TWILLINGATE/ NEW WORLD ISLAND	
		T1	T2	T1	T2	T1	T2
Age (yrs)	n	18	14	39	28	33	37
	Mean	41.8	42.5	40.6	41.2	44.4	43.8
	Range	25-59	26-58	26-57	26-54	28-58	24-60
Position (%)	n	16	10	38	25	29	34
	Physician	6.3	0	0	4	6.9	8.8
	Nurse	37.5	50.0	60.5	72.0	58.6	61.8
	Admin	12.5	0	13.2	0	3.4	0
	Other	43.8	50	26.3	24	31.0	29.4
Role (%)	n	18	13	39	28	33	37
	Team Member	50.0	53.8	76.9	85.7	63.6	73.0
	Physician Network	0	0	0	3.6	6.1	2.7
	PHC Network	44.4	46.2	5.1	7.1	18.2	8.1
	Don't know	5.6	0	17.9	3.6	12.1	16.2

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.2.2 Team Functioning

Items from the Team Effectiveness/Scope of Practice Survey included in this study address three areas related to team functioning: a) communication and information exchange, b) coordination of care and c) scope of practice. Two additional items are more generally related to team functioning. Respondents were asked to indicate the extent to which they agreed or disagreed with a series of statements related to each area.

5.2.2.1 *Communication and Information Exchange*

With one exception, less than half (35.3 – 47.1%) of all Connaigre Peninsula respondents agreed with statements related to effective communication and information exchange at T1; 54.5% of respondents agreed that team members are open and honest when communicating. For Bonne Bay, a majority (60.0 – 80.0%) responded positively to all statements related to communication and information exchange at T1. For Twillingate/New World Island, responses were positive (50.0 - 77.8%) to most statements related to communication; 46.2% of respondents agreed that relevant information is exchanged in a timely fashion. The percentage of respondents who agreed that they effectively use technology to maximize team communications was significantly higher for Twillingate/New World Island compared to Connaigre Peninsula (77.8% vs. 45.7%, $p = 0.011$); there were no further statistically significant differences among sites at T1 for items related to team based communications and information exchange.

At T2, a majority of respondents from each study site responded positively to statements related to communication and information exchange, with the exception that 46.2% of respondents from Bonne Bay agreed that they effectively use technology to maximize team communications. Approximately 68% of both Connaigre Peninsula and Twillingate/New World Island respondents indicated that they effectively use technology to maximize team communications at T2. Responses to other items related to communication and information exchange were also similar among sites at T2 (i.e. no statistically significant difference detected).

The percentage of Connaigre Peninsula respondents who responded positively to statements related to communication and information exchange was generally higher in T2 compared to T1; the same trend was not observed for Bonne Bay and Twillingate/New World Island. The greatest observed increase for Connaigre Peninsula was in response to the statement "communication between scheduled meetings is effective" (35.3% at T1 versus 63.0% at T2).

Table 21. Communication and Information Exchange by Site, Percent Agree

STATEMENT		SITE					
		BB		CP		T/NWI	
		%	n	%	n	%	n
Communication between scheduled meetings is effective	T1	70.0	10	35.3	34	54.2	24
	T2	54.5	11	63.0	27	58.3	36
Relevant information is exchanged among team members	T1	80.0	10	47.1	34	55.6	27
	T2	69.2	13	57.1	28	55.6	36
Relevant information is exchanged in a timely fashion	T1	70.0	10	41.2	34	46.2	26
	T2	69.2	13	64.3	28	54.3	34
There is limited duplication of communication within our team	T1	60.0	10	39.4	33	50.0	26
	T2	75.0	12	55.6	27	50.0	34
Our team members are open and honest when communicating	T1	80.0	10	54.5	33	55.6	27
	T2	84.6	13	71.4	28	58.3	36
We effectively use technology to maximize team communications	T1	60.0	10	45.7	35	77.8	27
	T2	46.2	13	67.9	28	68.6	35

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.2.2.2 *Coordination of Care*

At T1, less than half of respondents at each site agreed that they are satisfied with the level of coordination between team members and network service providers. Fifty-three (52.8%) percent of Connaigre Peninsula respondents agreed that working as a team has resulted in service delivery being more integrated and coordinated, compared to 37.5% and 51.7% for Bonne Bay and Twillingate/New World Island, respectively. Less than 25% of respondents at each site indicated that their primary health care team does not effectively involve network providers. A higher percentage of respondents from Connaigre Peninsula agreed that they use common client/patient records/charts where possible, compared to Bonne Bay (58.3% vs 11.1%, $p = 0.022$).

At T2, respondents from Connaigre Peninsula and Twillingate/New World Island responded positively to all statements related to coordination of care. A significantly higher percentage of respondents from Connaigre Peninsula agreed that they are satisfied with the level of coordination between team members and network service providers, compared to Bonne Bay (71.4% vs 38.5%, $p = 0.044$).

There was an overall positive change observed in responses to statements related to coordination of care between T1 and T2 for Connaigre Peninsula respondents, most notably the effective involvement of network providers and the level of coordination between team members and network providers. Reponses to items related to coordination of care were more similar within Bonne Bay and Twillingate/New World Island at T1 and T2.

Table 22. Coordination of Care by Site, Percent Agree

STATEMENT		SITE					
		BB		CP		T/NWI	
		%	n	%	n	%	n
Our team does ***not*** effectively involve network providers	T1	15.4	13	23.5	34	24.1	29
	T2	23.1	13	3.6	28	16.2	37
We use common client/patient records/charts where possible	T1	11.1	9	58.3	36	51.7	29
	T2	40.0	10	74.1	27	53.1	32
Working as a team has resulted in service delivery being more integrated and coordinated	T1	37.5	8	52.8	36	51.7	29
	T2	46.2	13	64.3	28	55.6	36
Overall, I am satisfied with the level of coordination between team members and network providers	T1	40.0	10	47.4	38	45.2	31
	T2	38.5	13	71.4	28	59.5	37

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.2.2.3 *Scope of Practice*

At T1, a majority of Connaigre Peninsula (52.9%) respondents agreed that service is being delivered through appropriate providers; the percentage of Bonne Bay and Twillingate/New World Island respondents who agreed was 40.0% and 31.0%, respectively. Responses to other items related to scope of practice were similar among sites. Approximately 60% of respondents at each site agreed that other professionals utilize their professional expertise for a range of tasks. There were no statistically significant differences between sites at T1 for items related to scope of practice.

At T2, a higher percentage of Connaigre Peninsula respondents agreed that team-based functions are shared across professional boundaries compared to Twillingate/New World Island (71.4% vs 41.2%, $p = 0.017$) and that their scope of practice is being fully utilized within their practice setting (67.9% vs 42.9%, $p = 0.048$). There were no statistically significant differences between Connaigre Peninsula and Bonne Bay responses.

With one exception, there was an overall observed increase in the percentage of Connaigre Peninsula respondents who responded positively to statements related to scope between T1 and T2; the most notable change, from 44.4% at T1 to 71.4% at T2, was in response to the statement "team-based functions are shared across professional boundaries". The same trend was not observed for Bonne Bay and Twillingate/New World Island.

Table 23. Scope of Practice by Site, Percent Agree

STATEMENT		SITE					
		BB		CP		T/NWI	
		%	n	%	n	%	n
Service is being delivered through appropriate providers	T1	40.0	10	52.9	34	31.0	29
	T2	38.5	13	64.3	28	41.7	36
Team-based functions are shared across professional boundaries	T1	50.0	10	44.4	36	50.0	28
	T2	41.7	12	71.4	28)	41.2	34
Other professionals in my practice setting utilize my professional expertise for a range of tasks	T1	58.3	12	67.6	37	60.0	30
	T2	58.3	12	59.3	27	45.7	35
My scope of practice is being fully utilized within my practice setting	T1	41.7	12	47.2	36	53.3	30
	T2	50.0	10	67.9	28	42.9	35

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.2.2.4 *General Team Functioning*

At T1, a majority of respondents from all three sites responded positively to the statement, "Overall, I'm satisfied with the functioning of my Primary Health Care Team". Similarly, a majority of respondents from Bonne Bay (60.0%) and Connaigre Peninsula (51.4%) agreed that they would encourage other health care service providers to work in their practice setting; 46.4% of Twillingate/New World Island respondents agreed. There were no significant differences between sites at T1.

Again at T2, a majority of respondents from all three sites agreed that they were satisfied with the functioning of their Primary Health Care Team. A majority of respondents from Connaigre Peninsula (60.7%) and Twillingate/New World Island (62.9%) also agreed that they would encourage other health care providers to work in their practice setting; the percentage who agreed from Bonne Bay was 38.5%. Responses at T2 were similar among sites (i.e. no statistically significant differences detected).

Within the Connaigre Peninsula and Twillingate/New World Island sites, a slightly higher percentage of respondents indicated that they would encourage other health care provides to work in their practice setting at T2 compared to T1; the opposite trend was observed for Bonne Bay.

Table 24. General Team Functioning by Site, Percent Agree

STATEMENT		SITE					
		BB		CP		T/NWI	
		%	n	%	n	%	n
Overall, I'm satisfied with the functioning of my Primary Health Care Team	T1	77.8	9	64.7	34	59.3	27
	T2	53.8	13	64.3	28	51.4	35
I would encourage other health care service providers to work in this practice setting	T1	60.0	10	51.4	35	46.4	28
	T2	38.5	13	60.7	28	62.9	35

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.3 Client Satisfaction Survey

5.3.1 Characteristics of the Sample

Similar to the Team Effectiveness/Scope of Practice Survey, the Client Satisfaction Survey was developed and carried out as part of an evaluation of the larger primary health care renewal initiative. Presented in Table 25 are sample characteristics for the Client Satisfaction Survey. At T1 and T2, approximately three quarters (72-78%) of the sample at each site was female; age ranged from 18 to 91 years and was slightly higher within each site at T2. Sex distribution was similar across sites and time periods.

Table 25. Sample Characteristics, Client Satisfaction Survey

CHARACTERISTIC		BONNE BAY		CONNAIGRE		TWILLINGATE/NWI	
		T1	T2	T1	T2	T1	T2
Total Sample		301	351	354	352	389	359
Sex (%)	n	297	350	354	352	388	359
	Male	25.6	21.4	23.2	23.3	25.5	27.9
	Female	74.4	78.6	76.8	76.7	74.5	72.1
Age	n	297	350	354	352	388	359
	Mean (range)	54.1 (19-89)	54.8 (18-88)	49.7 (20-81)	51.8 (18-90)	53.9 (18-90)	56.1 (22-91)

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.3.2 Client Satisfaction

At both T1 and T2, a high percentage (83.0 – 96.1%) of respondents at each site indicated that they were satisfied with overall services (Table 26). The percent satisfied with services was greater for Twillingate/New World Island compared to Connaigre Peninsula at T1 (90.5 vs 85.6, $p = 0.040$) and T2 (96.1 vs 88.6, $p = 0.000$). Between T1 and T2, there was an observed increase in the percentage of respondents who were

satisfied with services within each site. The observed increase appears slightly greater for Twillingate/New World Island and Bonne Bay compared to Connaigre Peninsula, however no significance testing was carried out.

Table 26. Satisfaction with Overall Service by Site, Percent Satisfied

TIME PERIOD	SITE					
	BB		CP		T/NWI	
	%	n	%	n	%	n
T1	83.0	300	85.6	354	90.5	388
T2	89.7	350	88.6	351	96.1	355

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

5.4 Focus Group and Key Informant Interviews

5.4.1 Characteristics of the Sample

Fifteen individuals participated in the focus group session. Focus group participants included a clinical registered nurse (RN), licensed practical nurse (LPN), public health nurse, continuing care nurse, social worker, health records technician/administrative support worker, regional director of information systems, clinical information systems specialist, facility director/primary health care coordinator, health information manager, primary health care facilitator, regional director of health information, regional VP of medical services, as well as the ICT project manager and the provincial primary health care lead.

Eleven individuals participated in a telephone interview. Six individuals who participated in the focus group also participated in an interview. Key informants included the facility director/primary health care coordinator, two information systems directors (representing the former institutional health board and community health board), two RNs, a public health nurse, a continuing care nurse, a social worker, two nurse practitioners, a LPN and a health records technician/administrative support worker. In addition to representing various primary health care team members and roles in the ICT enhancement project, key informants included representation from each of the six sites within the Connaigre Peninsula primary health care setting. Attempts to recruit a local physician(s) to participate in an interview or focus group were unsuccessful.

5.4.2 Themes

Focus group and interview findings were grouped according to five broad themes and are summarized below. These include: 1) benefits realized, 2) unexpected consequences, 3) facilitators of success, 4) challenges/barriers to success and 5) information and technology gaps.

5.4.2.1 *Benefits Realized*

Overall, ICT enhancements received in the Connaigre Peninsula primary health care setting were perceived to be beneficial. This is evident through comments such as "*It has been such a benefit to us*", "*...definitely worth the work, worth the effort*" and "*This is one area I can really see, feel, hear, taste, that primary health care made a difference, in terms of information management and access to information.*"

Participants identified a number of specific examples of how the ICT enhancements were beneficial. Perceived benefits can be categorized into six main areas:

a) improved access to existing information

Access to existing information has been improved through a number of technical enhancements including:

- dial-up at remote clinics where there was previously no access, enabling look-up of diagnostic testing information via Meditech;
- improved connections at district clinics where access was previously slower, enabling faster access to existing information;
- Meditech access by community health staff, who previously did not have access to patient clinical information;
- access to Meditech and/or CRMS at certain points of care through the use of mobile technology, including the acute care and long-

term care setting and during home visits by a continuing care nurse;

- internet access in district clinics, where there was previously no access, enabling access to internet and online resources; and
- tools to generate statistics and electronic reports from clinical and administrative data.

A provider who practiced at one of the clinics outside the main site made the comment,

> *Before I used to call Harbour Breton to get reports. Any mail that comes from Central goes to Harbour Breton and only comes to us once a week. So sometimes the report would be sitting in an envelope in Harbour Breton somewhere. Now, if we didn't get our mail, I can look it up. It saves a lot of time. Sometimes they put you on hold and that's no good if [we] need it ASAP.*

Another commented,

> *[Providers] who visit the more remote clinics can access any investigations that have been done - and we've had problems with that, reports getting missed or reports getting left behind - but those things now don't have an impact because they can look them up on the computer.*

b) improved administrative functioning

Another benefit, as perceived by key informants, is improved administrative functioning. A number of examples of improved administrative functioning were identified, for example a more efficient appointment scheduling process. Prior to implementation of the Meditech scheduling application, appointments were done by "hand and paper". Health records/administrative

support staff would set up appointment schedules for each physician and coordinate its use among several staff.

> *Before, there was only one book and there could be two or three people answering the phones, so you would have to wait. Now there's two computers and a couple more in offices nearby. It was time consuming before and for correcting things in the appointment book, it had to be rubbed out. Now it's more neat, organized and accessible.*

Standardized patient registration, including the ability to search for individual patients or patient groups, is another example of improved administrative functioning following ICT enhancements. Prior to the implementation of the Meditech registration module, with connection to the Newfoundland and Labrador Client Registry, registration was carried out in an ad hoc manner and sometimes not at all. As one individual pointed out,

> *We didn't do registration before. We used to take their number and look up the patient file on cardex and pull the chart. Now we just go into Meditech.*

Further,

> *We can search for patients as well. If someone comes in and don't have their blue card, we can put in their name and look their chart number up.*

Time savings on specific tasks was also identified as an improvement in administrative functioning. One example of time savings is related to the ability of community health staff to access their documentation system via mobile

devices (i.e. tablet computers) as there is "*...a lot of driving back and forth to remote sites. Community health staff can do documentation without having to go back to the office. They can chart as they go.*" In addition, there were examples of decreased effort to carry out certain tasks. For example, referral forms, that were previously completed by hand, are now available electronically and can be pre-populated with patient demographic and clinical information available in Meditech.

While the technical enhancements were felt to have decreased time and effort for some tasks, it was also suggested that the ability to complete certain tasks electronically doesn't necessarily mean that the task could be completed in a more timely manner. However, the generation of less paper in some areas, such as the acute care and long-term care setting, was felt to offset the time and effort. As one participant offered, *"It's still time consuming, but now we're used to it and its better than all the paper."*

Few key informants spoke of any benefits associated with having email access. When prompted, however, focus group and interview participants referred to improved communication among team members via email.

c) improved documentation

Improved documentation, in terms of quality and quantity, was discussed as a benefit of the enhancement of ICT. A number of specific examples were identified including improved legibility of documentation for acute care and long-term care patients through the Meditech nursing module, as well as improved

quantity and quality of documentation through standard electronic assessment tools, including the diabetes collaborative flow sheet and the long-term care minimum data set (MDS).

> *... we do our MDS now every three months whereas before it was paper, and nobody updated it properly. The care plans were done up initially, yes, and [they] used to get on our case, you know, that it had to be updated, but it wasn't done properly. It wasn't.*

The use of mobile technology allowing documentation at the point of care, thus minimizing loss of information through recall, was also identified as a benefit. "*It makes documenting much better. They document as they do care now.*"

As previously noted, the improved registration process has resulted in improved patient demographic information.

> *Demographics were never checked and insurance was never checked. Someone could have been married for 5 years and not have their name changed.*

d) improved team functioning

Improved team functioning through improved information sharing was also evident through discussions with key informants. Improved team functioning is most notable between the acute care sector and community health sector.

> *...community health staff have access to Meditech's PCI system, and that was a direct result of the primary health care project. ... I don't believe*

that colleagues in Twillingate or Bonne Bay or other sites have access to Meditech, for example, for lab or radiology reports.

It also appears that team members are putting more thought into the information they are capturing and how it will be used by others. One individual noted,

...the kinds of questions that I've been getting, sometimes just to say, well, we're doing this here, does this make sense and the kind of dialogue we've had is that people, you know, are really moving down the road and thinking about the information they're putting in and the information they're getting out and whatever, so I think there's a difference in the amount of information sharing.

It was also noted that there was an expectation by the Office of Primary Health Care (the primary supporter of the ICT enhancements received) that team functioning would improve through the implementation of the electronic diabetes flowsheet. However, findings suggest that rather than being used by multiple team members in a collaborative manner as originally envisioned, the electronic flowsheet has been used mainly by one provider 3-4 times per year at regular diabetes clinics. "*...all disciplines are not using that as a routine part of their files which is what that should be like.*" While this has the benefit of improved documentation for diabetes patients, it appears to have little impact on team functioning.

e) improved access to services

Another benefit of the technical enhancements is improved access to secondary care services for patients living within the catchment area of the Connaigre Peninsula primary health care site, through videoconferencing capabilities. The ability to access secondary care services remotely is thought to be a significant benefit to the patient, who otherwise would have to travel outside the community, which can be both costly and stressful, particularly for an individual who is terminally ill. As one key informant described it,

> *Before, the patient would go in and speak to the doc for 5 minutes in St. John's. It's a 3 day trip to see the physician in St. John's. You got accommodations, gas, food and childcare.*

It was also noted by several participants that videoconferencing capabilities provides health care providers with better access to educational opportunities. One participant said,

> *If I only had a certain amount of money, I'd say videoconferencing has the most benefit for staff and patients. It saves staff travel time and patient travel time and you can participate equally as well, so I think that was a big gain.*

To date, videoconferencing has been used primarily for oncology consultations and staff educational and training sessions.

f) increased accountability

A final perceived benefit is increased accountability as a result of automated and/or manual logging of individuals who has created or accessed information. One example given was in relation to the long-term care minimum data set (MDS) standard assessment tool; "*...now as part of MDS, we have to sign off and show that it has been done and being done...When you log on you know your initials are there and you are responsible for it.*"

5.4.2.2 *Unintended Consequences*

As a result of the information and communication systems enhancement project, there were some unintended consequences; that is, things that occurred that were not expected or explicitly identified as an expected outcome. Unintended consequences were both positive and negative.

An important positive consequence was the foundation that was laid for further information management and primary health care team enhancements, through: a) the establishment of a training room that can be used for on-going training; b) inter-departmental meetings, which created an awareness of issues and needs across departments; and c) the development of a training toolkit, that could be used across the province in primary health care settings carrying out similar information and communication system enhancement projects.

...when we sat down with all the different departments, we became more aware of issues that we may not have been aware of.

A negative consequence was incidents of staff accessing data on friends and family members following the implementation of new technologies. These new technologies provided easy access to information that was not as easily accessible in the past. However, this turned into a positive consequence as it was recognized that additional work on privacy protocols would be needed in the new electronic environment and were subsequently initiated. "*Privacy protocols need work. There are lots of issues.*"

In additon, while some technical enhancements were intended to provide benefits in a particular area, they were found to create challenges in another area. One example is related to the use of hand-held PDAs in the acute care and long-term care setting. While a PDA enables quick access to the documentation system at the point of care, failure to use it properly can result in increased demand on other staff.

> *The LPNs like the quick access with the palm pilots. The data all goes into the same place, but the handhelds are not wireless, so when you sign off, the data is transferred to the big system. Sometimes the girls might forget to send the data. When we do our print out at the end of the shift, if they forgot to send it, we have to send it and do the print outs again.*

5.4.2.3 *Facilitators of Success*

A number of factors were identified that contributed to the overall success of the ICT enhancement project. Among these were:

a) the interest and willingness of front-line staff

> *Most were eager to have it, so were eager to learn.*

b) the training approach, including the combined effects of:

i) "train-the-trainer", whereby one team member ("lead hand") went for extensive training and came back on site to train and provide support to others;

It gives the users a sense of ownership.

ii) on-site support, where a regional trainer came to work with the local trainer;

...definitely having a trainer on site; you would never have done it without it.

iii) the establishment and use of a training room;

We set up a training room with 5 computers. We would never have gotten all staff trained.

iv) training in small groups; and

The small groups were really good. If you have too many people, wouldn't get individual attention. We only had 5 people at a time.

iv) training in the "live" environment.

When you're doing the training, it's completely different than when you go into a live setting.

c) engaging end users in the planning process

Talk with the different departments because every department has a need and say what changes you think you need and give them time to think about it and do a wish list. I found that when we sat down with all the different departments, we became more aware of issues that we may not have been aware of.

d) having necessary supports in place, including:

i) financial support from the provincial Office of Primary Health Care as well as the Regional Health Authority;

I really give credit to the Office of Primary Health Care for allowing us to get these things so much faster.

...as a Board... signed on to absorbing the on-going operational cost for the network, whereas the primary health care project funded the initial package.

ii) effective leadership;

Make sure you have an exceptional facilitator, a go-getter.

Everyone got on board and got it done.

iii) a good training environment; and

We did the training in the boardroom. There are 4 or 5 computers. Everyone went there. Even at night we could go in the training room and practice.

iv) easily accessible technical support during early implementation.

I'd say within a week we were all pretty comfortable. But we still had the person from our department that could help us out instead of calling Grand Falls.

Even if we had a problem at night, we could call and she could access her screen and walk us through it.

5.4.2.4 *Challenges/Barriers to Success*

While the project was perceived a success in many respects, there were some challenges encountered that may have impeded the full realization of benefits. Among the perceived barriers were:

a) less input in the planning phase from staff at remote clinics

> *I don't know if there was any input into where the computers were put. You might as well put it in the waiting room. It's not very private. The docs don't even use it. And if I had to make a guess, I'd say it's because of where it's to.*

b) no change management plan

This was particularly important outside the main site in Harbour Breton where there were staffing shortages and the implementation of new information and communication technologies created increased demand on the already overextended staff and took clinical staff away from their main responsibility of providing patient care. In addition, because of the improved access to information, some physicians and other providers expected other clinical staff to retrieve electronic information and print it for them.

> *We can't use the registration module appropriately because of lack of clerical.*

> *Before we only put a check mark by the persons name to say OK, they're here. Now it takes a bit of time when you have other things to do. My main priority is the patient.*

At the main site in Harbour Breton, the same resource shortages were not experienced and thus the lack of a formal change management plan was not seen as a major limitation of the project.

> *It just got incorporated as we went along. There was no change management plan.*

In addition, for some of the newly implemented technologies, some staff felt that it created additional work and they did not see any benefit in return. One example is the minimum data set (MDS) standard assessment tool.

> *It's very time consuming, everyone will say that. We don't really know what we're doing and its really time consuming. It's a lot of work. I don't really see anything that it's being used for. We put it in the computer, but don't really do anything with it. It's not being used for my purposes for anything. I don't know, it might serve a bigger purpose that I don't know about.*

Another example is the electronic flowsheet for diabetes care.

> *I haven't really been using that a lot. I can't find the time. I find it too labour intensive, too slow and too cumbersome.*

c) poor alignment between requirements identified during the needs assessment and actual need

While most requirements identified in the needs assessment were found to be beneficial following implementation, some requirements identified do not appear reflective of actual need. The most prominent example of this would be the

use of mobile technology (tablet computers) by social workers. A need for mobile technology was identified during the needs assessment for use by social workers at the point of care and for accessing client records when on-call. However, the nature of the work, described as "*intense*" and "*interactive*", limits the usefulness of mobile technology at the point of care.

> *The computer might make it seem like you're not too interested in the discussion with the young person.*
>
> *Social workers didn't find the access in the field any benefit. They could use either a laptop or desktop at home...but not useful at point of care.*

Unlike social workers, the use of mobile technology was perceived to be beneficial by other community health staff. However, the replacement of desktop computers with tablet computers resulted in reduced comfort while working from their office due to the smaller screen compared to a desktop monitor.

d) loss or lack of leadership

While effective leadership was identified as a facilitator of overall success of the project, the team experienced the loss of their Primary Health Care Coordinator to cancer during the later stages of the project. The Primary Health Care Coordinator was thought to be fundamental in moving forward this project and, more broadly, primary health care reform in the area. Although the Facility Director assumed the coordinator role following the loss of their original coordinator, it was felt that some of the outstanding projects lost momentum.

A lack of physician leadership or a physician champion for the use of ICT to support the care process was also seen as a barrier to success. While no physician primary health care team member volunteered to participate in the current study, other primary health care team members described the physicians in the area as "*generally reluctant*" and without the support of a physician leader they were unreceptive to incorporating the use of new information and communication technologies into their practice.

> *We were hoping to bring on documentation for physicians but [the physicians] are not overly receptive at times and are difficult to bring on board. If [the Primary Health Care Coordinator] was still there, [they] would have come on board. The leadership role was a big thing. [The Primary Health Care Coordinator] would have made sure.*
>
> *Other physicians basically follow [the physician lead]. Lack of leadership was a battle.*

e) training and technical support for some components was insufficient

For most components, training and technical support was described as "*very good*", "*adequate*" and even "*fabulous*". However, for some components, particularly for staff outside the main site in Harbour Breton and for some community health staff, training was often referred to as "*slow going*" , "*not great*" and "*minimal*". The fact that training and technical support were being coordinated out of the regional referral centre was felt to be a contributing factor.

I haven't used it very much. We didn't get a whole lot of training to be honest.

Timing of training...we should have had it when the equipment was received.

We did one training session, but would have liked more. There are some limitations being rural with some of the IT services centralized in Grand Falls, so it was hard to schedule.

In addition, some staff were not "*computer savvy*" prior to training in the specific technologies, which made the training a little more difficult for them.

Some of the...staff weren't trained on a computer before and they found it a bit difficult, so of course to begin they were intimidated by the computer itself and the programs. I think they were intimidated by us as well because we were catching on better. They should have been given a background to the computer itself first. We eased them on and helped them out.

A lot of physicians are foreign trained and are not all good with computers.

In addition, some staff, both in the acute care setting and the community health setting, weren't available for training for a variety of reasons and no further training sessions were provided. It was recognized that this should be addressed on a go-forward basis.

...staff change...training should occur when that staff come back.

f) unrealistic expectations

The expectations of some were not met through the ICT enhancements. For expected outcomes such as less paper generation, the ability to order diagnostic tests by community health staff and efficient access to existing information at remote clinics, it appears that some team members did not understand the functionality or capabilities that would be enabled through the ICT enhancements. That is, they were expecting the enhancements to lead to outcomes that were not necessarily intended.

> *I thought there would be less paper generated and my expectation is not being met.*
>
> *Ordering and that kind of stuff...that hasn't changed at all.*

g) Competing priorities/unforeseen circumstances

Some technologies identified in the needs assessment and included in the funding proposal submitted to the project management team, such as the dictation/transcription system and Medinet, were not implemented or fully operational at the time of data collection for this study. With the exception of an unexpected change in wireless internet services in the area by the internet provider (which limited the use of mobile technology by community health staff in the area), a lack of human resources was identified as the number one reason for implementation delays. It was suggested that the restructuring of the health

boards, which brought with it many new projects, was a major contributor to the lack of human resource capacity.

> *... our original target date was to have all the projects completed by March 31st but again because of limited resources, human resources, and other competing projects, we haven't been able to.*
>
> *...so many unknown and new projects that we have encountered over the past eight to ten months, that we haven't been able to properly implement, complete the implementation of our projects as we had intended.*
>
> *The time line to do it is not extensive... being pulled in multiple directions has been the challenge.*

One area in which delays were experienced that was not directly linked to the lack of human resources or health board restructuring was in enabling acute care staff access to patient information in the community health information system (CRMS). As the former institutional and community health boards had recently been consolidated, it was thought that it would be easier to provide acute care staff with CRMS access. However, as the CRMS is a provincial system, it was found that the decision to allow access to acute care primary health care team members could not be made locally or even at the health region level.

> *We don't have CRMS access in the institutions for immunizations records or dressings that community health looks after. There's no way of knowing what was done. I understand this is a provincial issue.*

5.4.2.5 *Information and Technology Gaps*

While there were a number of benefits identified as a result of the ICT enhancements, there were also a number of remaining information and technology gaps identified. These included: a) outstanding items identified as part of the needs assessment and included in the funding proposal that were not yet implemented at the time of data collection; b) other information gaps related to services provided within Connaigre Peninsula primary health care setting; c) limitations or gaps specific to the district and remote clinics; and d) gaps in information related to services provided outside the primary health care setting.

a) At the time of data collection for the present study, outstanding components included:

i) Medinet, a Meditech interface that would allow electronic exchange of laboratory orders and results between the primary health care setting and the regional referral laboratory;

ii) a dictation/transcription system, that would allow health records staff to access digital dictated files and share transcribed files with the authorizing physician electronically; and

iii) access to CRMS, the community health information system, for authorized clinical staff. Access to CRMS by clinical staff would enable access to health information such as immunization records and documentation by the continuing care nurses.

The delay experienced with both Medinet and the dictation system was attributed to lack of human resources, as previously discussed. Providing access to CRMS for acute care staff was noted to be a Provincial issue, as CRMS is a Provincial system. Thus, approval to allow access was outside the scope of the Connaigre Primary Health Care team area and the regional health authority. It was recognized that the inability to access CRMS by acute care staff places limitations on continuity of care for patients.

> *There's a continuum of care and they're not seeing everything right through to the community.*

b) Other information and technology gaps identified within the local area included:

i) electronic outpatient documentation;

ii) electronic order entry for blood work and x-ray in the outpatient setting;

iii) access to previous inpatient files in the outpatient setting;

> *In the outpatient setting, we still have access to Meditech but can not access patient files when they aren't inpatients. This is one thing I have a problem with and a lot of others have the same problem.*

iv) computers in exam rooms; and

v) a complete system containing all necessary information or a single interface to all required information.

While no physician practicing within the Connaigre Primary Health Care setting volunteered to participate in the study, other participants noted that computers in the exam rooms and a single interface may encourage physicians to use ICT more in their

practice. It was suggested that a single system or single interface may help as well, but it was also recognized that there are other issues to address with respect to physician usage.

> *If they had a system that met all of the physicians' needs, one stop shopping, the physicians would be more receptive.*
>
> *We thought Meditech could fill some of the gaps, but not the whole picture. [The physicians] are looking for one stop shopping. If we had a system that interfaced to Meditech that met all needs, they'd be more receptive.*
>
> *Providers shouldn't have to be concerned whether or not the information came from Meditech, CRMS, PACS, wherever, just that they had a single sign on system, they got access to the information.*
>
> *If there was a single interface, it might make it easier, but I don't know if it would make them use it more. They are generally reluctant.*
>
> *...this is one instance that I do think that a specific application or software would need to be purchased in order for it to be successful. We could make it work within Meditech but there were some limitations.*

It was also recognized that the ICT enhancement project was not intended to be the ultimate solution to all information issues, but rather provide some benefit in the interim while larger provincial initiatives were in development.

> *We were concerned about putting in some interim technologies...and then as a provincial initiatives came on screen finding out that, uh-oh, they weren't quite as in sync with what was happening and thrown in the garbage. So we were trying to avoid throw-aways, so that the three icons* [Meditech, CRMS and diabetes flowsheet] *on the desk top approach was sort of our way of saying, well, we know*

if we get the three main systems there on the desktop, we are not going to go wrong.

We are seeing for example provincially that there is the iEHR project, which is the glue that's going to haul everything together, but, well, that doesn't help you right immediately now, in Connaigre...like these enhancements have.

If some of the small problems can even be fixed first, we can deal with the bigger ones after. But be reasonable, don't dream and don't be afraid.

c) Further limitations or gaps identified outside the main site included:

i) the inability to use mobile technology at the point of care by appropriate community health staff in outlying communities, where it is thought to have the most benefit;

ii) inability to access CRMS at remote clinics;

iii) difficulties in accessing Meditech at remote clinics due to slow processing times; and

iv) no internet access in remote clinics.

At remote clinics, the internet is the biggest one, just looking for research, so I think that would be the biggest thing.

There's no internet access, just a connection to Meditech...can't even access internal Meditech email...can't get that screen to open up...

Much of the limitations and gaps identified outside the main site are related to the unavailability of network coverage. Without high-speed access, Meditech is slow and it is

not possible to use CRMS at all. In addition, some of the equipment implemented at the remote sites was missing important pieces and described as "*old*" and "*not up to par*".

> *...have a computer...but they're old and don't use it anymore...only have dial-up and it takes too long.*

> *It's dial up so it takes ages and would be quicker to pick up the phone and have it faxed. And in the tiny little clinics you have patients there and the helicopter might be waiting so you do the quickest thing possible to get the information.*

> *...don't even have printers out there. It would be good to print blood work rather than write it on scrap paper and bring it back in the room to talk to them about it.*

d) Beyond the gaps and limitations identified at the local level, a province-wide electronic health record (EHR), including a province-wide laboratory information system and drug information system, is felt to be crucial to providing high quality care as well as to efficient administrative functioning. While the ICT enhancements received enables greater access to patient information, it was recognized that there remains a lot more patient information that they do not have access to. Being able to access all patient information was felt to be particularly important to patient safety.

> *Everything is great in our region but everything else is still so separate. We don't see the [encounters] from other regions. Sometimes we have to stop, call in and get referrals. If I had some blood work done in St. John's, we wouldn't know here. It should be automatically sent back to the family physician, public health nurse, continuing care or mental health. Everything is out there but it's tying it all together.*

We absolutely need a provincial file...and every time you do something like change medications or order blood work that all needs to be in a place so whoever looks at the file can go in and look at it and see all the issues, and they're all on the same page. It's even a huge safety issue. It's not even safe with all these medications and you have changes in medications. I constantly have to ask about medications. The sooner they bring it in, the better it will be in places like this.

Even with our own system, it's a case of the right hand not knowing what the left hand is doing. Our people already have several charts. A lot of people in Recontre find it easier to go to Burin rather than to Harbour Breton. Two different health systems; that's Central East, ours is Central West. We can't access Meditech in Central East. Even with the merger of boards, we can't access that Meditech.

If we had one system, we could share data better. Everything is loose; nothing is tied together. We're separated from everything else.

The biggest thing is a province-wide record, especially medications. It would help the problem with drug abuse and multi-doctoring. It would just solve a lot of problems. I would welcome that with open arms. It would be just fabulous for us. It would solve a multitude of problems.

5.5 Document Review

Through a review of existing documents, including the funding proposal, status reports and invoices submitted to the project management team, information related to expected and actual costs were extracted and are summarized in Table 27. Itemized costs included equipment costs and human resources costs. It was not possible to identify all associated human resource costs as the cost proposal indicated in-kind contribution from the regional health authority, however limited detail was provided in the funding proposal and documentation on in-kind contributions was not available. Maintenance costs were not included in the funding proposal and thus were not captured in the analysis. Further details, including an itemized break-down by equipment versus human resource costs, are provided in Appendix Y. However, given differences between the format and level of detail of the funding proposal versus that of the invoices subsequently submitted to the project management team for reimbursement, it is not possible to directly compare expected costs and actual costs at the item level.

Table 27. Expected and Actual Costs

CATEGORY	COST ($ CAD)	
	Expected	Actual
Institutional	101,000	112,000
Community Health	44,000	19,000
Total	**145,000**	**131,000**

6. DISCUSSION

This chapter begins with a discussion around the development of the evaluation protocol, response rates and sample characteristics. This is followed by a discussion of study findings organized according to the three research questions. Finally, policy implications emerging from the study findings and study strengths and weaknesses are identified and discussed. Where possible, study findings are discussed in relation to previous relevant research.

6.1 Development of the Evaluation Protocol

The development of the evaluation protocol for this study was guided by "A Proposal for the Development of an Evaluation Framework for Health Information Systems Initiatives", by Neville et al. (2004). Unlike some evaluation approaches, the approach outlined by Neville et al. (2004) supports flexibility in the evaluation and does not present a single, theoretical model or include complex methodology to guide the study. Rather, it builds on the recommendations, experiences and lessons learned from previous evaluations in the area of health information systems to outline a practical step-by-step approach to guide the development of the evaluation protocol. In addition to contributing to scientific knowledge, the purpose of evaluation research is to produce maximally useful evidence within a specified budget and time constraints (Cronbach, 1982 as cited in Neville et al., 2004) to support policy or program decision-making by the users of the evaluation (Weiss, 1972; Ovretveit, 2002; Rossi & Freeman, 1993 as cited in

Neville et al., 2004). Thus, a practical approach, rather than a purely scientific approach, is preferred in evaluation research, as was exercised in this study.

Among other important strategies, the approach by Neville et al. (2004) emphasizes continuous engagement of key stakeholders throughout the evaluation process, starting with the development of the evaluation framework, to help ensure that research questions are important and relevant, data collection methods are feasible and the evaluators are informed of any changes that occur in the environment that may impact the study. This collaborative process of engaging users of the evaluation findings in designing the evaluation and collecting information that is relevant to real values and decisions has been referred to by Ovretveit (2002) as action evaluation. In this study, stakeholder engagement began with the invitation of key individuals from each of the three study sites, as well as representatives from other target audiences, to a pre-evaluation workshop. The purpose of the workshop was to help identify the research questions and potential indicator areas to include in the study. The engagement of stakeholders during early stages of evaluation also creates an awareness and sense of ownership. This may increase the likelihood that they will be cooperative during later stages of the study when they are asked to participate in the study or aid in data collection. It should be cautioned, however, that stakeholder engagement can be time consuming, resource intensive and conflicts can arise due to differences in interests between stakeholder groups. Further, it can be difficult balancing stakeholder interests with scientific rigor and stakeholders may have difficulties accepting findings with which they do not agree (Keown, Van Eerd and Irvin, 2008). Despite the potential challenges,

stakeholder engagement in the research process is important as it increases the likelihood that study results will be considered and utilized (Lomas, 2000). The optimal level of stakeholder involvement may warrant further consideration.

The approach described by Neville et al. (2004) also highlights the importance of using multiple methods in the evaluation of health information systems projects. It is difficult to find a perfect measure to quantify the benefits resulting from information systems initiatives in health care (Leonard, 2000), particularly within a short time frame and as it relates to health outcomes. As in this study, the use of intermediary variables, or proxy indicators (which can lead to improved health outcomes in the health care system) are often considered for inclusion (Donaldson, 1996). The use of multiple methods and multiple data sources is therefore important so that results obtained from a number of data sources can be combined for a more complete evaluation and strengthen the robustness of the evidence related to the impact of the system or initiative being examined (Kaplan, 1997). Nonetheless, the task of consolidating the findings of a multi-method evaluation can be one of the most difficult components of the study of complex health information initiatives (Heathfield et al., 1999; Herbst et al., 1999; Moehr, 2002; Lau, 1999).

Neville et al. (2004) further suggests that the indicators and methods chosen for the evaluation of a health information system initiative should include consideration of the tradeoffs involved, such as relative importance of the indicator, availability of data, resources available and timing of the evaluation. The evaluation should also be timely, realistic and practical (Grant et al., 2002). The current study incorporated both

quantitative and qualitative methods and primary and secondary data collection strategies including surveys, interviews, a focus group and document review. Due largely to restrictions around timing and funding, these methods were determined to be the most feasible, utilizing previously collected data wherever possible. During early development of the evaluation protocol, the inclusion of additional indicators and methods were discussed related to turnaround time and duplicate testing that would better quantify changes following the enhancement of ICT. Through discussions with front line clinical and technical staff, however, it was determined that it was not feasible to include these indicators in the study as required data could not be extracted from source systems.

While the approach proposed by Neville et al. (2004) was considered most appropriate to guide the present study, practical experience can now offer suggestions to improve or strengthen this approach. Most notable is the realization that it is not always possible to follow the seven steps in a linear fashion as presented. In this study, components of steps two through five progressed concurrently as discussions and planning occurred with respect to why, what, when and how to evaluate. In addition, greater emphasis should be placed on working with key stakeholders to determine data availability, particularly for secondary data sources, prior to establishing research questions. This was evident in the current study as the level of required detail related to cost was found to be unavailable during data collection. As suggested by Cusack and Poon (2007a), it is also important to determine the goals of the project or initiative as the project goals may be different than the expected benefits that are identified by end users. Stakeholders should be guided to identify research questions and indicators that align

with the goals of the project and measures that are of high scientific rigor. Finally, new indicators that have been proven to be useful in this and other recent studies could be added to the menu of potential indicators that is presented, such as measures of the impact of ICT on team functioning and the measure of relative benefit (benefit-to-effort ratio) used in this study.

6.2 Response Rates and Sample Characteristics

As discussed, both primary and secondary data collection strategies were utilized in this study. Primary data collection in Phase I included a pre-evaluation workshop and interviews with key individuals at each study site. Primary data collection in Phase II included a survey of primary health care team members at each study site, supplemented with a focus group session and interviews with primary health care team members and key individuals involved in the enhancement of ICT in the Connaigre Peninsula primary health care team setting. Secondary data collection included a review of project documentation and a secondary analysis of data collected through two surveys within each study site as part of the larger primary health care renewal initiative.

6.2.1 Pre-Evaluation Workshop

In the development phase of this study (i.e. Phase I), a pre-evaluation workshop was carried out with 17 individuals including representatives from each of the three study sites, the Office of Primary Health Care, the Centre for Health Information and researchers interested in the evaluation of health information systems. Participant perspectives included clinical, technical, clerical and managerial. In the development

phase of the study, there was little or no direct input from two stakeholder groups – physicians and community based providers. However, input was received from other clinicians and individuals that could provide a community health perspective.

6.2.2 Key Informant Interviews (Phase I)

Interviews were conducted with key individuals that were considered most knowledgeable at each study site, including Primary Health Care Coordinators and IT Directors, to obtain or confirm information on the technical environment, as well as the primary health care setting and services delivered. Each site had one Primary Health Care Coordinator and two IT Directors (one responsible for institutional systems and one responsible for community health systems). A total of eight interviews were conducted as one IT Director was responsible for two study sites as a result of consolidation of health boards within the province.

6.2.3 Primary Health Care Team Survey

The response rate for the Primary Health Care Team Survey was somewhat lower than expected at 39.5%, 41.7% and 22.7% for the Bonne Bay, Connaigre Peninsula and Twillingate/New World Island study sites, respectively. A review study of 321 mail surveys published in medical journals in 1991 found an overall mean response rate of 60% and a mean response rate of 68% for surveys of non-physicians (Asch, Jedreziewski & Chistakis, 1997).

Several factors may have contributed to the lower than expected response rate. First, the mailing list for the target group for the survey, obtained through the Primary Health Care Coordinator at each study site, included members of the broader primary health care network, in addition to primary health care team members. Health care providers, especially physicians, are more likely to respond to a survey on a topic that is relevant to them and that they have an interest in (Kaner, Haighton & McAvoy, 1998). As some network providers would have had little involvement with the primary health care team, they may have felt that they were not able to contribute to the study and, thus, may not have responded to the survey.

Other possible reasons for the low response rate include timing and length of the survey. During the primary health care renewal initiative, a number of surveys were administered to the same target group. As the survey for this study was administered near the end of the primary health care renewal initiative, some primary health care team members may have been experiencing "survey burn-out" and less likely to respond than to earlier surveys. The survey was also administered in June (first mail-out) and September (second mail-out), a time of year when many individuals take vacation in Newfoundland and Labrador. Further, the survey itself was quite lengthy and some survey items were not relevant to all participants. Respondents were instructed to indicate "not applicable" and refrain from completing such items, however this may have had an impact on the perceived length of the survey.

During the development phase of the study, consideration was given to separate surveys for clinical and administrative staff. Due to the generalist nature and dual role of

many team members as well as the small target population size, it was decided that a single survey would be most appropriate. It is not uncommon, for example, for a single individual to fill two part time positions such as a LPN and clerical position, or for a nurse to book appointments or register patients at a clinic in a rural or remote area.

The distribution of survey respondents with respect to position or role varied among sites. This is not unexpected as the Framework for Primary Health Care Renewal in Newfoundland and Labrador suggests that the range of services provided by a primary health care team should be based on the needs of the area, as well as available resources (Government of Newfoundland and Labrador, 2003). A large proportion of respondents from each site were female (80-94%) and in their current position for 10 or more years (48-62%). The sex distribution among respondents is reflective of the distribution of the population surveyed. The small sample size limits the ability to analyze and compare survey results by sample demographic characteristics.

In only one site, Twillingate/New World Island, were there physician respondents. The lack of physician response to the survey outside the Twillingate/New World Island site may be related to the observed general lack of interest of most physicians in ICT, as well as in the current evaluation. As discussed, physicians are more likely to respond to a survey if they are interested in the research topic or if they perceive the topic to be relevant to their practice (Kaner et al., 1998), thus greater familiarity and experience in a technical environment among physicians practicing within the Twillingate/New World Island site may have contributed to the higher response by physicians at that site.

Schaefer and Dillman (1998) suggest a mixed-mode strategy as a means of minimizing survey non-response. In this study, two options were given for completing the survey: a paper version and an electronic, online version. Each potential participant received a link to the online version along with their survey package and was given the option to complete and return the paper version or the online version. Only 4 respondents completed the electronic version, with no respondent completing the electronic version from the Bonne Bay site. This finding is not unexpected for the Bonne Bay site as there is little technical capacity within the Bonne Bay primary health care setting. With respect to the other two study sites, this may be a reflection of a lack of computer access for tasks unrelated to health care delivery or possible technological restrictions of the respondent's computer. Response rates to electronic surveys have been found to vary among populations (Kongsved, Basnov, Holm-Christensen & Hjollund, 2007; Couper, Traugott, & Lamias 2001; Sills & Song 2002). Andrews, Nonnecke and Preece (2003) identified a number of factors associated with electronic surveys that may affect response rate including survey design, subject privacy and confidentiality, and survey piloting.

6.2.4 Focus Group and Key Information Interviews (Phase II)

As the survey sample was too small to carry out analysis by site (i.e. main site versus satellite clinic) or by provider type, focus group and interview data were valuable in that they enabled a richer understanding of the impact of the ICT enhancements among particular sub-groups.

Focus group and interview participants covered a range of stakeholders and perspectives including technical, clinical, clerical/administrative and managerial. Similar to other components of the study, no physician practicing within the Connaigre Peninsula primary health care setting participated in the focus group or interview; all physicians practicing within the area were invited to participate through numerous contact attempts, to no avail.

The focus group included a larger number of participants than preferable (n = 15), as the ideal number of participants for a focus group is between five and ten (Kruger & Casey, 2008). However, a decision was made to carry out the focus group at the end of a pre-scheduled meeting as it would otherwise require significant travel for some participants to participate in a focus group at another time.

6.2.5 Team Effectiveness/Scope of Practice Survey

The Team Effectiveness/Scope of Practice Survey was administered to primary health care team members at each study site by the evaluation team responsible for the broader evaluation of the primary health care renewal initiative. Response rates for T1 were 42.9%, 62.9% and 26.8% for Bonne Bay, Connaigre Peninsula and Twillingate/New World Island, respectively. Response rates for T2 were 33.3%, 45.2% and 30.1%, respectively. With the exception of a somewhat higher response rate for Connaigre Peninsula at T1, response rates for this survey were similar to that obtained through the survey developed for this study (i.e. the Primary Health Care Team Survey). Similar to other components of the study, there were no physician respondents from the

Connaigre Peninsula or Bonne Bay site, and only two from the Twillingate/New World Island site. Unlike the Primary Health Care Team Survey, respondents to the Team Effectives/Scope of Practice Survey specified "other" position type which included a range of positions and disciplines.

6.2.6 Client Satisfaction Survey

Data received from the evaluators of the broader primary health care renewal initiative for use in this study included only surveys in which all data was considered usable (i.e. responses were available for all items). A majority (72-79%) of respondents from each study site were female; mean age ranged from 50 to 56 years.

6.3 Findings

Through consultations with key stakeholders, three research questions were identified for inclusion in the evaluation. Research questions focused on: 1) perceived benefits resulting from the enhancement of ICT; 2) costs associated with the implementation of the new technologies; and 3) lessons learned during the implementation process. In the following section, study results are discussed in relation to the three research questions.

6.3.1 Benefits

Benefits were expected in three areas including: a) team functioning, b) quality of care and c) administrative functioning. In addition, relative benefit and effort associated with specific technology-enabled functions were examined.

6.3.1.1 *Team Functioning*

The nature of health care and, arguably, primary health care in particular, is beyond the ability of one individual to deliver (Safran et al., 1998). Primary health care is therefore characterized by providers in different roles working collaboratively to deliver a broad range of services. An important characteristic of a collaborative approach to care is the ability of individual health care providers to function as a team. In this study, a number of factors related to team functioning were assessed, including: a) communication among providers, b) coordination of care, c) scope of practice and d) provider role satisfaction. Some items were specifically related to the impact of ICT on team functioning; others were more broadly related to team functioning.

Communication is a fundamental pathway through which individual roles develop into a functioning team (Orasanu & Salas, 1993 as cited in Safran et al., 1998) and is crucial for patients receiving care across health care settings (Preston, Cheater, Baker & Hearnshaw, 1999). In this study, results of the Primary Health Care Team Survey indicate that communication among providers within the Connaigre Peninsula primary health care team, and to a lesser extent outside the primary health care team, improved following the primary health care renewal initiative. Results of the Team Effectiveness/Scope of Practice Survey also indicate that communication among Connaigre Peninsula primary health care team members is more effective in the new technical environment, particularly between scheduled team meetings. Improved communication among Connaigre Peninsula primary health care team members may be attributable, at least in part, to the new capacity for electronic messaging. The findings of this study support

those of Safran et al. (1998) who found that an electronic record and email system had a positive impact on team based communications and collaborative processes.

In addition to improved communication, rapid availability of patient information helps provide a mechanism for coordinating care across multiple health care providers (Johns, Simborg, Blum & Starfield, 1977). Results of the Primary Health Care Team Survey indicate that Connaigre Peninsula primary health care team members have more information on individual clients following the primary health care renewal initiative, compared to both Bonne Bay and Twillingate/New World Island. Improved access to existing information (such as laboratory and diagnostic imaging results), particularly outside the main site and among community health providers, was also identified through the focus group and interviews as a benefit realized from the enhancement of ICT in the Connaigre Peninsula primary health care setting. Findings of the Team Effectiveness/Scope of Practice Survey also indicated greater satisfaction with the level of coordination among team members and between team members and network providers, compared to Bonne Bay (site with minimal technical capacity). There was little change in satisfaction with coordination among team members in the Bonne Bay and Twillingate/New World Island sites following the primary health care renewal initiative. This suggests that the trend towards improved coordination among Connaigre Peninsula primary health care team members may be associated with the enhancement of ICT at that site. These findings are consistent with those reported by Marshall and Chin (1998) who found an outpatient electronic charting and ordering system improved the ability to coordinate care of patients with other providers and departments. As observed

by Safran et al. (1998), patient information is more likely to be consulted in a computerized environment when discussing an issue with another provider because of the ease of access, thereby facilitating care coordination.

Primary health care team members were also asked if specific technology-enabled functions had a positive impact on coordination of care. Within both the Connaigre Peninsula and Twillingate/New World Island sites, each with a high level of technical capacity following the primary health care renewal initiative, a large majority of primary health care team members who use the functions perceive all technology enabled functions to have a positive impact on coordination of care. The ability to access diagnostic images and laboratory results is perceived to have the largest contribution to coordination of care. A somewhat conflicting finding between data sources in this study was that results of the Primary Health Care Team Survey indicated the electronic diabetes flow sheet had a positive impact on coordination of care, while findings from the qualitative component of the study suggested that this standard assessment tool was not being used as intended. Rather than being used by multi-disciplinary members of the primary health care team for a collaborative approach to care for diabetes patients, focus group and interview participants suggested that it is used by a small number of providers, largely nursing staff, to simply document diabetes care and that the main benefit was related to improved documentation rather than improved coordination of care. As found in other studies that have assessed the impact of computerization in a primary health care setting (e.g. Wager et al., 2000), it is possible that both are benefits that are realized to different degrees among team members. It is also possible that the diabetes flow sheet is

not being used for the purpose and to the extent intended, as suggested by key informants.

Also important to interdisciplinary team functioning is awareness and sharing of team-based responsibilities across professional and organizational boundaries (Cooper & Fishman, 2003). Team Effectiveness/Scope of Practice Survey results suggest that the Connaigre Peninsula primary health care environment is more supportive of sharing team-based functions across professional boundaries following the primary health care renewal initiative. Further, a higher percentage of Connaigre Peninsula respondents agreed that team-based functions are shared across professional boundaries compared to Twillingate/New World Island respondents. While both Connaigre Peninsula and Twillingate/New World Island were operating in a highly technical environment following the primary health care initiative, there were some capabilities at the Connaigre site that were not available or used at the Twillingate/New World Island site that may have contributed to this finding. For example, at the Connaigre Peninsula site, community health providers were provided with access to clinical information (such as laboratory test results) during the primary health care renewal initiative, which allows them to make decisions that would otherwise require a clinician. In addition, the long term care minimum data set (MDS) standard assessment tool enables the assessment to be completed and used by multiple providers in the provision of patient care. Such a collaborative team approach, enabled through the enhancement of technical capacity, is important to team functioning and can help reduce the fragmentation of care (Westberg & Hilliard, 1993).

This study also assessed provider satisfaction with team functioning and with their primary health care setting in general. In the Connaigre Peninsula, a majority of primary health care team members indicated that they were satisfied with team functioning, with similar findings before and after the primary health care renewal initiative. Further, greater than 60% of respondents from the Connaigre Peninsula and Twillingate/New World Island sites, each with a high degree of technical capacity, agreed that they would encourage other health care providers to work in their practice setting at T2, compared to 38.5% of Bonne Bay respondents. A recent evaluation of a province-wide picture archiving and communications system (PACS) in Newfoundland and Labrador identified the existence of PACS in a health care setting as important to recruiting and retaining radiologists, particularly in rural areas of the province (MacDonald, 2008). It may follow that the existence of other information and communication technologies is important to attract and retain other health care providers as well. On the other hand, Burton et al. (2004) suggest that if clinicians are satisfied with current levels of team functioning, they may be less likely to accept new technology as a facilitator of improvement. This may partially explain the lack of interest and use of the technology by physicians in the Connaigre Peninsula primary health care setting.

While trends in these findings indicate that enhanced technical capacity may facilitate team functioning in a variety of ways, the lack of statistically significant findings for most items might suggest that there are other factors affecting team functioning in each site. Hampson, Roberts and Morgan (1996) suggest that a cultural change which compels health professionals to make sharing of patient information a high

priority is also needed to improve team functioning. Other factors important to team functioning include effective leadership, knowledge of organizational goals and strategies, organizational commitment, respect for others, and commitment to working collaboratively and achieving quality outcomes (Leggat, 2007).

6.3.1.2 *Quality of Care*

Information and communication technology (ICT) is also recognized as having significant potential to improve the quality of care in primary health care settings. This study examined perceptions of a number of aspects related to quality of care following the primary health care renewal initiative including: a) information quality, b) continuity of care (i.e. informational continuity), c) adherence to practice guidelines, d) patient safety, e) access to services and f) patient satisfaction with care received.

In a systematic review of the literature, Hayrinen, Saranto and Nykanen (2008) noted that one or more aspects of information quality were examined in all 89 studies included in their review, with data completeness and accuracy most frequently used. Findings of the present study identified a number of ways in which information quality improved following the enhancement of ICT in the Connaigre Peninsula primary health care setting. In the inpatient setting (acute and long-term care), computerization of the charting function has improved legibility of nursing notes and the use of mobile technology (i.e. PDAs and mobile laptop carts) has minimized the loss of information to memory as nursing staff no longer have to go back to their desk to record notes. In addition, the implementation of a registration system has improved patient demographic

information and standard assessment forms has resulted in more and better documentation for particular patient groups, such as diabetes patients and long-term care patients. Supporting the findings of this study, Hayrinen et al. (2008) identified a number of studies that have found that the use of an information system and, to a lesser extent, structured data entry is conducive to more complete documentation.

In addition to improved information quality, informational continuity - the availability and use of information on prior health care events (Hennen, 1975 as cited in Reid et al., 2002) - is important in a team-based approach to primary health care, where patients see multiple members of the primary health care team and care is coordinated across services. Specific measures of information continuity are not well developed. However, a recent review and synthesis of the literature on continuity of care suggests that measures of informational continuity should focus on whether pertinent information exists and is transferred between providers, as well as whether providers are aware of and use the information that is transferred (Reid et al., 2002). Findings of this study suggest that the enhancement of ICT in the Connaigre Peninsula primary health care setting has contributed to improved informational continuity in some areas and for some team members. A number of examples of improved access to existing information enabled through the enhancement of ICT were identified, particularly for providers outside the main site and community health providers. A majority of Connaigre Peninsula survey respondents indicated that they were able to act on test results in a more timely fashion and were better able to make decisions about patient care. Previous research has also

identified improved decision making to be a perceived benefit of enhanced ICT in primary care (Pagliari et al., 2005).

Findings also suggest that the implementation of computerized standard assessment tools, including the diabetes flow sheet and the long-term care minimum data set (MDS), has resulted in a perceived improvement in adherence to practice guidelines for some team members. Nearly 60% of Connaigre Peninsula primary health care team members indicated that they are better able to adhere to practice guidelines following the primary health care initiative. A comparison of Connaigre Peninsula survey responses to that of Twillingate/New World Island suggests that computerized standard assessment tools may have an additional effect on adherence to clinical guidelines compared to paper-based versions, as Twillingate/New World Island primary health care team members used a paper-based version of the same diabetes flow sheet. A recent systematic review by Chaudhry et al. (2006) identified increased adherence to clinical practice guidelines or protocol-based care as the major effect of health ICT on quality of care.

With respect to patient safety, strategies for preventing errors and adverse events include tools that can make knowledge more readily accessible, acquire key pieces of information, improve communication, perform checks in real time, assist with calculations, assist with monitoring and provide decision support (Bates & Gawande, 2003). When specifically asked, less than half of Connaigre Peninsula respondents (43.3%) felt that patient safety had improved following the primary health care initiative. However, findings from other components of the study identify ways in which the enhancement of ICT might support patent safety. For example, improved access to

patient information, as previously discussed, can play a role in improving patient safety, as many errors in health care result from inadequate access to data (Bates & Gawande, 2003). Improved communication among team members also has a role in improving patient safety. As Bates and Gawande (2003) point out, failure of communication between clinicians is among the most common factors contributing to the occurrence of adverse events. In addition, an awareness that computer systems create audit logs of persons that have created or accessed information has resulted in an increased sense of accountability among some team members. While it has been suggested that individual accountability promotes the "shame and blame" environment and can obstruct efforts to improve care (Rask, 2005), it is also possible that this increased sense of responsibility has improved accuracy and completeness of patient information.

Improved access to services for residents of the Connaigre Peninsula also followed the enhancement of ICT in the primary health care setting. Telehealth is particularly beneficial in remote and rural areas, such as the Connaigre Peninsula, where the delivery of health care services is limited by distance and lack of physician specialists to provide secondary care services (Allen & Hayes, 1995; Boulanger, Kearney, Ochoa, Tsuei & Sands, 2001; Hovenga, Hovel, Klotz & Robins, 1998). Without telehealth services, a resident of the Connaigre Peninsula would have to travel a considerable distance from their home and their family to see a specialist, often a two- to three-day journey. While utilization may be low compared to some other services provided, the potential for improved quality of care for residents of the Connaigre Peninsula that avail of the service is felt to be significant. Consistent with the findings of this study, a recent

evaluation of the teleoncology program in Newfoundland and Labrador found overall support for the program. The program is perceived to offer many benefits, including cost savings in terms of travel and time expenses, convenience, more timely care, better continuity of care and allowance for greater family support for patients during care (Mathews, Ryan, Keough, Heath & Chowdury, 2007). Through a review of the literature, Jennett et al. (2003) identified additional benefits of telehealth that support the findings of the present study including increased access to services, better quality of care, improved health outcomes and better quality of life.

While not an aspect of the care process, patient satisfaction is also frequently used as a measure of quality in health care research (van Campen, Sixma, Friele, Kerssens & Peters, 1995). In this study, there was little change in patient satisfaction in the Connaigre Peninsula area, with greater than 85% of residents surveyed indicating that they were satisfied with services before and after the introduction of the technical enhancements. This finding was similar to that of Garrison and colleagues (2002) who assessed overall satisfaction with health care received before and after the implementation of an electronic environment. While there was no statistically significant increase in patient satisfaction, Garrison et al. (2002) found no evidence of decreased satisfaction with care in the electronic environment, as overall satisfaction with care received at the clinic was high (i.e. greater than 80% rated the care they received as excellent or very good) in both the non-electronic and electronic environment. High overall satisfaction with care in both the non-technical and technical environment notwithstanding, the other two study sites appear to have had a higher percentage of patients satisfied with services before the

primary health care renewal initiative compared to the Connaigre Peninsula site and a higher level of satisfaction following the primary health care initiative. From the primary health care team member perspective, 30.0% and 50.0% of Connaigre Peninsula and Twillingate/New World Island primary health care team members, respectively, reported improvements in patient satisfaction following the primary health care initiative. These findings may indicate a correlation between the use of computer systems at the point of care and patient satisfaction, as an important difference between the two sites is that most exam rooms in the Twillingate/New World Island setting were equipped with computers for use at the point of care. There is moderate evidence that enhanced technical capacity will improve patient satisfaction as most studies related to the impact of health ICT on patient acceptance or satisfaction have found that computer use does not have negative effects on services received (e.g. Adams et al., 2003; Garrison et al., 2002; Solomon & Dechter, 1995; Hsu et al. 2005). However, given that satisfaction also increased in the Bonne Bay area, this suggests that factors other than the use of ICT are playing a role in satisfaction with health care services in these areas.

6.3.1.3 *Administrative Functioning*

In addition to improving the health care process, ICT has the potential to positively impact administrative functioning and improve workflow (Schattner, 2006). This is important as administrative work can prevent health care providers from being able to provide patients with health care services (Arias-Vimarlund, Ljunggren & Timpka, 1996).

Findings of this study indicate improvements in some areas of administrative functioning in the Connaigre Peninsula primary health care setting. In particular, a majority of team members experienced less duplication of testing and less time spent looking for patient information. While comparisons between Bonne Bay and Twillingate/New World Island are not presented here, there were some differences detected between these sites that are further suggestive of time savings on certain tasks with greater health information and communication capacity, including the ability to see more patients per day. As suggested by Lorenzi, Kouroubali, Detmer and Bloomrosen (2009), this "found time" can be devoted to other value-added activities.

In addition to examining whether changes had occurred in administrative functioning following technical enhancements in the Connaigre Peninsula primary health care setting, the qualitative component of the study examined *how* administrative functioning improved and captured specific examples of improvement. A number of improvements were identified for administrative support staff including a more efficient appointment scheduling and registration process and decreased time and effort required for some tasks, such as looking for a patient's chart or preparing referral letters. Specific examples of administrative improvement were identified by other team members as well including less generation of paper, particularly in the nursing unit, and less time and effort to track down diagnostic testing results for community health staff and providers who work in satellite clinics. Results of the Primary Health Care Team Survey indicate that the ability to access diagnostic images and laboratory results, as well as electronic

appointment scheduling, are perceived to have the greatest contribution to improved administrative functioning.

Previous studies have had conflicting findings related to the impact of health ICT on administrative functioning and, while few studies have included team members other than physicians, impact on workflow has been found to vary by role. Shu et al. (2001 as cited in Pizziferri et al., 2005) found that ordering tests required 5% more time following computerization, while Keshavjee et al. (2001) found that time spent on charting increased by 50% following computerization, but returned to baseline at eighteen months post-computerization. In a time-motion study, Pizziferri et al. (2005) found no change in amount of time spent on direct or indirect patient care in an electronic environment, however physicians perceived the electronic record system to have a negative impact on workload. In a case study of EMR implementation in a rural family practice in the US, O'Neill and Klepack (2007) reported that physicians and nurses spent less time on routine tasks and were freed from some routine tasks that did not directly add value to patient care, such as pulling charts and locating information. Administrative support staff were better able to answer routine questions that used to require a physician, nurse or office manager. While not directly comparable to the present study, another study in an emergency department (Litaker et al., 2005) reported that 60% of nurses were able to finish work faster following the implementation of an EMR system, while only 20% of physicians reported the same.

6.3.1.4 *User Satisfaction and Relative Benefit and Effort*

While technical performance alone cannot ensure that ICT will be used or be a valuable tool in health care delivery (Wager et al., 2000), user satisfaction with technical performance is sometimes used as a proxy for effectiveness (Weir, Crockett, Gohlinghorst & McCarthy, 2000). Overall, Connaigre Peninsula primary health care team members were most satisfied with technical performance for laboratory and diagnostic imaging results look-up. Downtime for the electronic diabetes flow sheet, registration and appointment scheduling were perceived to be most disruptive to workflow. In a qualitative study by Wager et al. (2000) that assessed the impact of an EMR system in the primary health care setting, system downtime was identified as the biggest limitation or concern among both clinicians and support staff. They had become so reliant on the technology that they found workflow very frustrating during system downtime and described it as everything coming to "a screeching halt".

With respect to usability, diagnostic imaging look-up, messaging and laboratory results look-up were considered easiest to use among Connaigre Peninsula primary health care team members; the diabetes flow sheet standard assessment tool and videoconferencing were the most difficult. In a case study of telehealth as a means to improving health care accessibility in Quebec (Sicotte & Lehoux, 2003), it was found that the new technology was not being used in the manner or the extent anticipated and the cause was attributed to the administrative burden on the users. In the end, the health care providers that had been using the technology returned to their routine practice without telehealth consultations. Similarly, in this study, the lack of satisfaction with

certain functions, most notably videoconferencing and standard assessment tools, puts these technology-enabled functions at risk of not being used as intended or, potentially, at all. There is some evidence that this may already be true for certain functions, including the diabetes flow sheet. Ease of use, or user friendliness, does not necessarily mean that there has to be a fancy interface, but rather the ability for the user to easily access the knowledge base, extract the required information and use it as part of their daily routine (Maglaveras et al., 2002).

Similar to technical performance and usability, satisfaction with training and technical support also varied among functions. While training and technical support was described as "*adequate*", "*very good*" or even "*fabulous*" for most components, for some components, training was referred to as "*slow going*" and "*not great*" and "*minimal*". Survey results indicate that training and technical support in the Connaigre Peninsula area was perceived to be the best for registration/search and define client lists and laboratory results look-up; training and technical support were most lacking for videoconferencing. Only one third of users were satisfied with training for the diabetes flow sheet standard assessment tool, however more than eighty percent were satisfied with technical support in this area. Adequate training has also been identified as key to successful implementation of ICT in a number of previous studies and in a variety of health care settings (e.g. Lorenzi et al., 2009; Yoon-Flannery et al., 2008: Zandieh et al., 2008; Terry et al., 2008).

Like Marshall and Chin (1998), this study examined the relative benefit and effort of each technology-enabled function. Findings show that, for all functions, the perceived

benefit outweighs the perceived effort to use it. In the Connaigre Peninsula site, benefit-to-effort ratios were highest for messaging, followed by laboratory results look-up, diagnostic imaging look-up and registration/search and define client lists. Consistent with other findings of this study, benefit-to-effort ratios were lowest for videoconferencing and the diabetes flow sheet standard assessment tool. With the exception of a few functions, a majority of primary health care team members indicated that each technology-enabled function meets their needs and only a small number said they would return to the old way of working. Overall, these findings were similar to those reported by Marshall and Chin (1998) in that, for each component of the system studied, the benefit to patient care outweighed the effort required to use it. Further, the results reporting system was perceived to have a greater impact on care compared to other system components. Given that benefit-to-effort ratios were lower for Connaigre Peninsula respondents for all functions compared to Twillingate/New World Island, this might suggest that the overall benefit increases with experience, as the Twillingate/New World Island team had been operating in a highly technical environment for several years at the time of this study. Supporting this, previous research has found increased efficiency improvements with continued experience with new health information technologies (Overhage et al., 2001).

Overall, findings of this study are suggestive of a relationship between user satisfaction and benefits realized, as many of the perceived benefits have been linked to specific technology-enabled functions for which user satisfaction has been the greatest. Given that benefit-to-effort ratios were greater than one for all functions, however, this

suggests that users feel that the effort required to use each technology-enabled function is a manageable tradeoff for the benefit that it offers to patient care. These findings are consistent with findings of a study of time utilization before and after the implementation of an electronic health record in a primary care setting by Pizziferri et al. (2005), as well as an evaluation of a clinical information system in Kaiser Permanente (Chin & McClure, 1995), where overall benefits were recognized and clinicians chose to use computerized systems despite perceived increases in amount of time required for certain tasks. As discussed, however, inefficiencies and increased administrative burden might also lead to under use of ICT, or refusal to use it at all.

6.3.2 Cost

The enhancement of ICT in the Connaigre Peninsula primary health care setting was carried out using a phased approach to implementation, leveraging existing technologies to fill important functionality gaps where possible. While the "intervention" in the present study included only those technologies or functional enhancements that were implemented as of March 31, 2006, costs (budgeted and actual) associated with all proposed enhancements are included in the cost analysis as most items were purchased and/or invoices were submitted to the project management team by March 31, 2006.

Based on the information available, the project was carried out within the proposed budget of $145,000. However, it was not possible to do a direct comparison of specific budget items to actual costs due to differences in the level of detail of the funding proposal and invoices received by the project management team. It was also not possible

to consider all associated human resource costs as the funding proposal indicated an in-kind contribution of regional-level technical staff, with no time or financial estimate and no record of actual time or cost available. Further, flexibility was exercised by the project management team to accommodate additional ICT enhancements that were not identified in the original proposal, given that some proposed items were procured under budget. To do a comprehensive comparison of budgeted versus actual costs as was done in the evaluation of the Newfoundland and Labrador Client Registry (Neville, Gates & MacDonald, 2005), it would be necessary to carry out a detailed project scoping exercise prior to commencing the ICT initiative and include all resource requirements, including in-kind human resource contributions.

The costs associated with the Connaigre Peninsula primary health care ICT enhancement project, as presented in Chapter 5 and Appendix Y, would not be directly transferable to other primary health care sites engaging in a similar ICT initiative due to differences in legacy systems that are available to build upon and leverage. However, consideration of itemized budgeted and actual costs as presented in Appendix Y can be used as an indication of specific areas in which resources are required and where resources are likely to be under- or over-estimated. While the intent of the present study was not to carry out a cost-benefit analysis, a comparison of budgeted and actual costs is an important accountability indicator and, when considered in combination with other study findings, supports the premise that a relatively small investment in ICT can play an important role in improving health care delivery in a community-based primary health care setting, such as the Connaigre Peninsula.

6.3.3 Lessons Learned

Through the experiences of the Connaigre Peninsula primary health care team and the findings of this study, several key lessons have been identified related to introducing ICT into a primary health care setting, some of which also have important policy implications. Lessons learned can be used in future initiatives within the Connaigre Peninsula, as well as by other community-model primary health care settings within Newfoundland and Labrador and other jurisdictions as they engage in similar ICT initiatives. Similar lessons have been identified in previous studies of health ICT implementation (e.g. Lee, 2007; Parker, 2002; Dinemann & Van de Castle, 2003; Husting & Cintron, 2003; Protti, 2003; Wager et al., 2000; Short, Frischer & Bashford, 2004; Kemper et al., 2006), however it is important that they are repeated and emphasized as they are not always considered in new initiatives. Lessons learned are discussed in relation to the issue and, where appropriate, recommendations for consideration are provided.

Lesson 1. Change management is not just an issue in large-scale health ICT projects.

In the Connaigre Peninsula primary health care setting, there was no formal change management plan for the new technical environment. It was felt that a change management plan wasn't necessary given that it was a small site and changes could be *"incorporated as they went along"*. However, examples of changes in workflow brought about by the new technology were identified that could have benefited from change management efforts. For example, the technology-enabled registration function was felt to have improved administrative functioning at the main site in Harbour Breton, while at

satellite clinics it was perceived by some to impede the quality of care by taking time away from the patient, as the clinician would be required to register the patient in addition to provide care. Similarly, while health care managers see significant potential to improve quality of care for long-term care patients through the minimum data set (MDS) standard assessment tool, this computerized assessment tool was perceived by some users to be time consuming and they were unaware of how the information they were collecting would be used.

The introduction of new health information technologies can result in changes in the job responsibilities of all team members (O'Neill & Klepack, 2007) and create further strains when there are staff shortages (Handly, Grubb, Keefe & Martin, 2003). It is therefore important to consider changes in workflow, as well as additional resource needs, particularly human resources, that might occur following the introduction of new technologies, even in small-scale projects.

Recommendation: Develop and implement a change management plan for all health ICT initiatives that includes education of users around changes in responsibilities and workflow, as well as addresses any changes in human resource requirements.

Lesson 2. There's no such thing as too much end user engagement.

There were examples of specific technical enhancements in the Connaigre Peninsula primary health care setting that did not fully achieve the benefits expected by end usrs. One example is related to the implementation of computers with dial-up Internet access at remote clinics. While having access to clinical information that was previously

only available in paper format and depended upon postal or courier service was expected to result in improvements in all three benefit areas examined in this study, full realization of benefits was not achieved. Impeding the full realization of benefits was the poor location of the computer and the slow speed at which information could be accessed. This led to increased frustration among users and, in some cases, refusal to use the newly implemented technology.

Another example is related to the use of tablet computers at the point of care among community-based social workers. While mobile technology was found beneficial for some care providers and in some settings, the same benefit was not realized among social workers as the nature of their work requires intense, interactive sessions and the use of technology during the session was perceived by providers to make the client uncomfortable and impede rapport between the client and provider.

Many end users were engaged in the planning process and interdepartmental meetings (held as part of the planning process) were identified as a contributor to overall project success. However, findings suggest that some users were not included in the planning process and/or expectations for the new technologies were not clear. In addition to identifying needs and setting expectations, involving end users in the planning of health ICT initiatives can increase interest and allow them to develop a sense of ownership, which may increase user acceptance (Chambliss, Rasco, Clark & Gardner, 2001).

Recommendation: Use appropriate means to engage all end users, set expectations early and reinforce them throughout the life of the project.

Lesson 3. Delayed implementation of health ICT initiatives as a result of unforeseen circumstances is not uncommon.

There were several challenges encountered during the ICT enhancement project in the Connaigre Peninsula primary health care setting that had a negative impact on the implementation schedule as well as negatively impacted the overall success of the project. Most notable were the restructuring of the health boards within the province - which brought with it many new IT projects - and the loss of the leadership of the Primary Health Care Coordinator during the latter stages of the initiative. The lack of IT resources and the loss of leadership resulted in implementation delays as well as a loss of momentum for some projects that were outstanding. While not all challenges can be avoided, identification of potential risks before they occur, along with mitigating strategies and contingency plans, can help minimize their impact (Royer, 2001).

Recommendation: Carry out a risk assessment prior to engaging in a health ICT initiative of any substantial size.

Lesson 4. Training is as important as the existence of the technology itself.

Information management must be taught, learned, practiced and continually improved before information technology can improve patient care (Gray, 1998 as cited in Koller, Grutter, Peltenburg, Fischer & Steurer, 2001). The approach to training in the Connaigre Peninsula primary health care setting was varied and, in general, findings indicate that users were most satisfied with and have realized the most benefit from specific technologies in which training was considered most adequate. An approach that

was found to contribute to overall project success includes: commencement of training immediately following implementation of the new technology; training a local team member to assume the role of "lead hand" to continue training following an initial training session by an expert trainer; a training environment that does not impede workflow and encourages learning in both a test and live environment; and on-site or quick-to-respond technical support. It was also recognized that some new users of ICT may not be "computer savvy" and that training should be tailored to include basic skills such as typing. In addition, training should continue as new users sign on.

Recommendation: To avoid frustration and maximize training benefit, training should occur prior to or during the implementation of new health information technologies.

Lesson 5. Physician resistance to the use of ICT is a multifaceted issue.

Primary data collection for this study included physicians in the targeted participant sample. While numerous strategies were employed to capture the physician perspective, physicians were largely unresponsive and may be due in part to their general lack of interest in the use of ICT. Other Connaigre Peninsula primary health care team members who participated in the study suggested a number of possible factors that contribute to physician resistance to the use of ICT. Among these are the fact that they are running a hybrid system, where physicians have the choice to use paper or electronic means to access most information; there is no access to computers in exam rooms; there is a perception that only a full EMR system can meet physician needs; many physicians

are foreign trained and/or do not have basic computer skills; there is no physician champion for the use of computers within the team; the fee-for-service model does not provide incentive for physicians to invest time or resources into the introduction of new health information technologies; and there is a lack of commitment to incorporate the use of ICT into everyday physician practice as there is a high physician turnover within the area. Previous research has also identified other factors contributing to physician resistance, for example, cost (Bates, 2005; Ash & Bates, 2005) privacy and security (Bates, 2005; Condon & Smith, 2002; Ariza, Binns & Christoffel, 2004; Ash & Bates, 2005) and performance concerns (Bates, 2005). However, as there were no physician participants in this study, only those factors perceived by other team members as impacting physician participation were identified.

Just as physician resistance is a multifaceted issue, it requires a multifaceted solution. A report on the Electronic Record Development and Implementation Programme (ERDIP) in England notes that physicians need to see practical benefits from health information technology (NHS Information Authority, 2001b). If they don't, they are likely to be less committed (Protti, 2003). Physicians have to be committed to career-long adaption and change (Jimbo, Nease, Ruffin & Rana, 2006) and physician-informatics leaders, in collaboration with other heath care and IT professionals, are instrumental to guiding the effort (Wager et al., 2000; Carr-Bains & de Lusignan, 2003). In countries such as Australia where heath information technology and various forms of electronic records have been widely adopted by physicians in primary care, there have been significant governmental initiatives such as providing financial support to help

cover the cost of implementing the new technology and offering incentives for use (Bates et al., 2003; Ford, Menachemi & Phillips, 2006). Bates notes in his landmark paper, "A proposal for electronic medical records in U.S. Primary Care", there are many barriers to physician adoption of health information technology, however none of them are insurmountable (Bates et al., 2003).

Recommendation: The acceptance and uptake of ICT by physicians should be addressed at a provincial level, with resources dedicated to thorough planning and the development of a province-wide strategy that will address the concerns of physicians and provide supports that will meet their needs.

Lesson 6. Health ICT initiatives are rarely isolated projects.

While the enhancement of health information and communication technologies in the Connaigre Peninsula primary health care setting has improved access to patient information for care received within the local area and to some extent throughout the region, this study identified additional information needs including information on residents who receive health services in other areas of the province and information on prescribed medications. Planning for local or small scale health ICT initiatives should entail recognition of future needs as well as an assessment of larger jurisdictional initiatives to ensure that scarce resources are not wasted or efforts duplicated and to ensure alignment for future integration. This approach was exercised in the ICT enhancement project in the Connaigre Peninsula primary health care setting, as the Newfoundland and Labrador Centre for Health Information, the organization responsible

for coordinating the implementation of the provincial electronic health record (EHR), was engaged to manage the project. As Bates (2005) points out, ensuring that health information technologies are able to interoperate is high priority.

Recommendation: To ensure alignment with other health initiatives and that future needs can be met, carry out an environmental scan and needs assessment prior to engaging in a health ICT project.

6.4 Policy Implications

In addition to the recommendations arising from the lessons learned, which have a more practical application, a number of important policy recommendations have emerged from the findings of the study, many of which have provincial or broader implications. Given the increased attention to and investment in health ICT initiatives provincially, nationally and abroad, a discussion of policy issues and recommendations arising from the study findings is important to help guide future planning, priority setting and decision-making.

6.4.1 Issues and Recommendations

While not a new premise, an important issue identified in this study is that there is a need for a province-wide electronic health record (EHR) as, even with complete access to patient information for services received within a health region, there is still relevant heath information that is not available, such as prescription information and information

on services received in other areas of the province. The need for a province-wide EHR in Newfoundland and Labrador was first recognized by the Health Information System Task Force in 1995 and has since been reinforced through numerous stakeholder consultation processes and research findings (e.g. Newfoundland and Labrador Centre for Health Information, 1998 and 2003; Gates, 2004; Neville, Gates and MacDonald, 2005; Battcock, 2005). While significant progress has been made with the implementation of a province-wide Client Registry, Picture Archiving and Communications System and Pharmacy Network (currently being implemented), it is recommended that efforts continue towards this end and that the provincial e-health strategy (Newfoundland and Labrador Centre for Health Information, 1998) be revisited to ensure that it is still representative of stakeholder needs.

In addition to the need for a province-wide EHR, there is also a need for major health ICT initiatives to be interoperable. It is recommended that all major health ICT initiatives be coordinated by, or at least vetted through, a single entity such as the Newfoundland and Labrador Centre for Health Information (the Centre). While the Centre has a mandate to develop and manage a province-wide EHR and is involved in many other provincial health ICT initiatives, there is currently no requirement for health ICT initiatives that are occurring within regional health authorities or private practices to involve the Centre in project planning, implementation or management. Such a central coordinating functioning would ensure standardization and interoperability, as well as reduce duplication of effort and poor investment.

Another important policy issue arising from the findings of this study is related to barriers to the use of ICT to share information between health care sectors or jurisdictions. One of the planned activities of the ICT enhancement initiative in the Connaigre Peninsula PHC setting was to enable the sharing of information between community health and clinical providers by providing appropriate providers with access to the other sector's health information system. While community health staff were able to gain access to clinical information in the Meditech system, clinical staff were not able to gain access to community health information. Both clinical and community health services are provided by the same regional health authority (RHA), however the community health information system, the CRMS, is a provincial information system. This is unlike the clinical information system, Meditech, which is a regional system. As such, the RHA was not able to grant clinical staff access to the CRMS because it was outside of its authority to do. While the technical infrastructure was available to enable the sharing of information, policies were not in place to allow this to occur. As the issue of sharing health information between health sectors or jurisdictions is not unique to the Connaigre Peninsula area, provincial level panning and policy development is required to facilitate sharing of health information among community health and clinical providers. This further supports the need for a central coordinating office and is particularly important as the province continues its efforts towards the implementation of a province-wide electronic health record.

Physician resistance to the use of health ICT also requires provincial level attention. It was recognized by those responsible for the ICT enhancement project that

physician resistance to the use of ICT is a multifaceted issue and beyond the ability of the local area or health authority to address. As previously discussed, the acceptance and uptake of ICT by physicians should be addressed at a provincial level, with resources dedicated to thorough planning and the development of a provincial strategy that will address the concerns of physicians and provide supports that will meet their needs. The strategy might include guidelines for physicians who are purchasing and implementing their own EMRs or other ICT solutions, incorporation of education and training related to the use and benefits of ICT in health care into the medical school curriculum, as well as financial incentives and payment models that enable physicians to implement and use ICT in practice. In addition, as physicians need to see benefits from using ICT before they will adopt, the strategy should support evaluations that include early adopters to demonstrate benefits and encourage further adoption.

A final policy issue identified through this study is the lack of connectivity across the province. There are a number of areas within the province where existing information systems, such as the community health information system (CRMS) and DI/PACS, cannot be availed of due to a lack of or limited connectivity. This is particularly important in rural and remote areas of the province, such as the remote areas of the Connaigre Peninsula that are only accessible by air or water. It is recommended that high speed internet coverage be extended to areas of the province in which it does not currently exist to enable access to existing health information by health providers who are approved access. Towards this end, a provincial broadband initiative has been initiated in Newfoundland and Labrador that will enable expanded delivery of high speed internet

access throughout the province, with construction planned to begin in the spring of 2010 (Canadian Business Online, 2009).

A summary of the policy issues and recommendations emerging from the study is presented below in Table 28.

Table 28. Policy Issus and Recommendations

ISSUE	RECOMENDATION
There is an identified need for a province-wide electronic health record (EHR).	Efforts should continue towards the implementation of the core components of an EHR and the provincial e-health strategy should be revisited to ensure that it is still representative of stakeholder needs.
There is a need for major health ICT initiatives to be interoperable.	All major health ICT initiatives should be coordinated by, or at least vetted through, a single entity such as the Newfoundland and Labrador Centre for Health Information.
Barriers exist to using ICT to share health information between clinical and community health providers.	Provincial level planning and policy development is required to facilitate sharing of health information between health care sectors or jurisdictions.
Physicians are generally resistant to the use of health ICT.	A provincial strategy should be developed to address the concerns of physicians and provide supports that will meet their needs.
There is a lack of internet connectivity across the province, preventive access to existing health information in some areas.	High speed internet coverage should be extended to areas of the province in which it does not currently exist.

6.4.2 Knowledge Transfer

In addition to identifying policy issues emerging from the study findings, it is important to ensure that such findings are communicated back to target audiences in such a way that it will be used in their work. While there is no universally agreed upon, all-encompassing model of knowledge transfer, the literature identifies a range of knowledge

transfer activities that have been successfully used and suggests strategies to support knowledge transfer and research uptake.

Engaging decision makers in the formulation and conduct of research is "the best predictor for seeing the findings applied" (Lomas, 2000). Lomas (2000) further notes that "it is more difficult to reject, discount or ignore research results when one has contributed to them". The literature identifies strategies that can be applied during the early stages of the research process to support knowledge transfer. As a first step, a range of audiences and decision makers should be identified (Canadian Population Health Initiative, 2001) and engaged to help identify researchable questions (Canadian Health Services Research Foundation, 2000). The development of a formal knowledge transfer plan during the early stages of the research process, allocating time and resources to knowledge transfer activities and incorporating all stages of the research process, will also facilitate research uptake and use by target audiences (Canadian Population Health Initiative, 2001).

While somewhat limited, the knowledge transfer literature also offers strategies that can be applied during study conduct to promote knowledge exchange and research uptake. Probably the most widely agreed upon strategy is to continue interactions with target audiences while the study is carried out. This continual exchange will allow both researchers and decision makers to stay informed of changes in context and how the research is evolving, allow decision makers to be involved in key decision points of the research process, as well as create momentum and maintain interest generated during research conceptualization. Another strategy to considering is providing stakeholders with preliminary results or drafts and encouraging feedback. This is important for two

reasons: 1) decision makers are more likely to use research evidence when they receive tentative results, as opposed to two or three years later when the study is finished (Feldman, Nadash & Gursen, 2001) and 2) feedback from decision makers can strengthen the applicability and usefulness of the research findings by helping interpret it within the context of the current decision making environment.

When it comes to the dissemination of research findings, one size does not fit all (Lavis et al., 2003). Thus, it is important that knowledge transfer strategies be fine-tuned to the specific audiences and the type of decisions they make (Lavis et al., 2003) and that the messages are appropriate to the environments to which they are directed (Black, 2001). If the goal of the communication activities goes beyond an increase in awareness, the communication should not only be targeted and tailored to the specific audiences, but should highlight important implications and the intended audience should be assisted in using it (Lomas, 1993). The literature highlights some specific strategies that can increase the likelihood that research findings will be utilized. For example:

- communication strategies should deliver "actionable messages" (Lavis et al., 2003). Decision makers are more likely to use research if implications are made apparent (Feldman, Nadash & Gursen, 2001);
- messages should be presented in a clear, concise (Canadian health Services Research Foundation, 1998; Canadian Population Health Initiative, 2001), visually appealing (Feldman, Nadash & Gursen, 2001) format;
- "ideas" rather than "data" are more likely to influence decision making (Weiss, 1991 as cited in Lavis et al., 2003);

- a credible messenger, such as a local opinion leader or field expert, is believed to increase research uptake by decision makers (Feldman, Nadash and Gursen, 2001; Shonkoff, 2000 as cited in Lavis et al., 2003); and
- face-to-face encounters, for example through one-on-one interactions, has been consistently found an effective means to transfer research knowledge (Lomas, 2000; Bero et al., 1998; Soumerai & Avorn, 1990).

In this study, key stakeholders were engaged throughout the research process, beginning with the development of the evaluation framework. In addition, a knowledge transfer plan was developed (Appendix V) that incorporated many of the strategies that can increase the likelihood that research findings will be utilized. Key stakeholders including the project management team, the Office of Primary Health Care and Primary Health Care Coordinators in the three study sites were also consulted and provided input into identifying the most appropriate dissimination methods.

In addition to the reports and presentations planned for deliverly at the conclusion of the study as identifid in the knowledge transfer plan, throughout the evaluation, interactions with key stakeholders were maintained and regular updates were provided to the Health Information Management Committee, a committee that was assembled during the PHC renewal initiative to provide guidance and monitor progress on several health ICT initiatives that were occurring in the province and linked to PHC. The Committee included government representatives, the provincial PHC Lead, IT Directors, representatives of the project management team and other key stakeholders. In addition,

a presentation of key messages was given to the Department of Health and Community Services Executive and preliminary findings were presented at two PHC symposiums in the province.

6.4.3 Evaluation of Knowledge Transfer Activities

Also important at this stage of the research process is the evaluation of knowledge transfer activities. While the knowledge transfer plan developed for this study did not include a formal evaluation plan, performance measures should be identified that are consistent with the goals of the knowledge transfer strategy. Performance measures can be process measures (e.g. how many outputs were produced from the research), intermediate outcome measures (e.g. whether awareness changed as a result of the research) or outcome measures (i.e. whether the research was used in decision making) (Lavis et al., 2003). However, measuring whether knowledge and recommendations generated from research is used in decision making and examining how informed decisions translate into improved performance or better health is better left as stand-alone research projects (Lavis, 2002) and, thus, was not included in the present study.

6.5 Study Strengths and Weaknesses

A number of strengths and weaknesses of this study have been identified and are discussed below.

6.5.1 Strengths

The most important strength of the evaluation is the engagement of key stakeholders throughout the study, beginning in the study conceptualization phase. Continual engagement of key stakeholders helps ensure that research questions are important and relevant, data collection methods are feasible, and changes that occur in the environment that may impact the study are identified and addressed. Engaging key users of the study findings early in the research process also increases the likelihood that study results will be considered and utilized (Lomas, 2000).

Another important strength of the study is the multi-method approach. Kaplan (1997) recommends the use of multiple methods in the evaluation of health information systems evaluation for two reasons: 1) because of the diverse and diffuse nature of information systems' effects and 2) results can be combined in a way that maximizes understanding of causal links by collecting a variety of data, each of which might provide partial information needed for a complete evaluation. Multiple methods and data sources enable triangulation of findings and can strengthen the robustness of research results. Further, the approach to the study included the use of previously collected data wherever possible, which was important in addressing restrictions around timing and available funding.

The focus on enhanced ICT in a community-model primary health care setting as a broad concept is also a strength of this study, as most studies of health ICT focus on practice-specific EMR. In addition to providing evidence to support the enhancement of ICT, benefit-to-effort ratios identified specific technology-enabled functions or

capabilities that are particularly beneficial to improving primary health care delivery. Other studies have separately assessed the benefits or examined the utility of specific functions or technologies, however only one other study (Marshall and Chin, 1998) was identified that examined relative benefit to effort, as was examined in this study, and with a focus on only two functions.

The study setting and target population is also a strength of the present study. Most previous evaluations have been carried out in urban practices that have a professional contact PHC model, in contrast to the rural, integrated community-model PHC setting in this study. This study also included all users of ICT in the primary health care setting. This allowed for the inclusion of multiple perspectives including clinicians and administrative support staff, as well as members of the larger primary health care network, rather than only a small core group of primary health care team members. As Mitchell and Sullivan (2001) note, most studies of health ICT initiatives focus on physicians, or to a lesser extent nurses, and future research should be expanded to include other members of the primary health care team. As the integrated community model, with multidisciplinary health professionals working in teams, has been identified as a preferred model of PHC in Canada (Lamarche et al., 2003), this study has greater generalizability in the Canadian context compared to previous studies that have been carried out in dissimilar settings.

Lastly, rather than carrying out a single case study, the inclusion of two additional study sites with varying levels of ICT and comparing study findings for the Connaigre Peninsula with that of other study sites provided greater insight into the perceived impact

of ICT on primary health care delivery, particularly as it relates to the community-model primary health care setting.

6.5.2 Weaknesses

One of the most notable weaknesses of the study is the low survey response rate and small sample size. This limited comparisons of important characteristics such as provider type and whether or not respondents use the information and communication technologies that are available. The small sample size also likely contributed to the lack of statistically significant differences between primary health care sites, particularly for comparisons that included Bonne Bay. The inclusion of the broader primary health care team may also have contributed to the low survey response rate as some network providers do not work closely with other team members and may have felt that they were not able to contribute to the study. However, all primary health care providers at each site were included in the target population, thus even with a 100% response rate, the sample size would have been small.

The lack of physician participation was also a weakness of this study. However, as the study was conducted in a community-model PHC setting with a large multidisciplinary team that consisted mainly of non- physician providers, the lack of physician participation did not have as large an impact on the outcomes of the study as would be expected in a primary health care setting that is predominately physician based, such as in the professional contact model.

The use of previously collected data was important in addressing restrictions around timing and funding, however this approach is limiting in that it does not allow for adjustment or refinement of indicators or the same level of quality assurance. It also does not allow for control over sample selection, thereby potentially limiting the type of analysis that can be carried out using the data. While the Primary Health Care Team Survey was developed for this study, it was not a validated tool. However, questions and measures used in the survey were adapted from previous research where possible.

The use of self-report data also introduces recall bias, particularly for survey items that asked respondents to consider their experiences in the current environment compared to their experiences before the primary health care renewal initiative (i.e. approximately two years prior). However, in the absence of well developed, direct measures, surveys are widely used in the evaluation of health ICT and are particularly important in understanding user satisfaction with new technologies.

While the gold standard approach (randomized control trial) was not feasible for this study or for most evaluations of complex information technology initiatives (Neville et al., 2004; Health Systems Trust, 2002; Heathfield et al,. 1998; Burkle et al., 2001; Ovretveit, 2002; Ovretveit and Gustafson, 2002), a pre-post study design would have been the preferred approach. However, circumstances associated with the timing of the intervention in the Connaigre Peninsula primary health care setting pre-empted the use of a true pre-/post-implementation design. While the inclusion of the two additional primary health care sites with varying levels of ICT did provide some capacity for comparison across sites, caution should be exercised in drawing conclusions across sites in this study.

7. SUMMARY, RECOMENDATIONS AND CONCLUSIONS

7.1 Summary

Primary health care is highly dependent on information as it requires coordinated efforts across sectors and levels of care. In recent years, information and communication technology (ICT) and electronic records have been advocated as a means of storing, accessing and sharing information concerning health and health care. Even in the absence of a full electronic health record (EHR), ICT and computerization of certain types of information can still facilitate aspects of primary health care.

An important part of the primary health care framework in Newfoundland and Labrador is the improvement of ICT. The Connaigre Peninsula primary health care setting was one of two settings chosen by the provincial Office of Primary Health Care to explore the value of sharing client information in an interdisciplinary environment through the enhancement of ICT. The approach to the enhancement of ICT in the Connaigre Peninsula site was to fill gaps in their current information and communication capabilities by building on existing technologies wherever possible. As such, a series of technical enhancements were made over an approximately one year period.

The goal of this study was to develop an evaluation framework, in consultation with key stakeholders, and use it to examine the impact of enhancing technical capacity in a community-model primary health care setting (i.e. Connaigre Peninsula). Following a pre-evaluation workshop and one-on-one consultations with key stakeholders, three research questions were identified for inclusion in the evaluation: 1) what are the benefits of the ICT enhancements and how do they compare to anticipated benefits; 2) what were

the costs of the ICT enhancements and how do they compare to projected costs; and 3) what are the lessons learned that can be used by other primary health care sites engaging in similar initiatives? A set of potential indicator areas related to each research question were also identified through consultations with key stakeholders.

The design of the evaluation was a comparative case study. In addition to the Connaigre Peninsula, the study included two additional primary health care settings that were similar with respect to population size, geography, setting of the primary health care team and services provided, as comparison sites. An important difference among the three sites was their level of technical capacity. The Bonne Bay site had minimal technical capacity at the beginning of the primary health care renewal initiative and received minimal enhancements during the initiative. The Connaigre Peninsula site also had minimal technical capacity but received significant enhancements as part of the primary health care initiative. The Twillingate/New World Island site had a moderate/high degree of technical capacity and received minimal enhancements during the initiative.

The target population for the evaluation was primary health care team members (including network providers and administrative support staff) in the three primary health care sites and individuals responsible for overseeing the ICT enhancement project in the Connaigre Peninsula primary health care site.

The approach to the evaluation included quantitative and qualitative methods and primary and secondary data collection strategies. Primary data collection included a survey of primary health care team members at the three study sites and a focus group

session and key informant interviews with key stakeholders associated with the information and communication enhancement project in the Connaigre Peninsula site. Primary data collection instruments were developed for the study, adapting questions and measures from previous research where possible. Secondary data collection included the Team Effectiveness/Scope of Practice Survey and the Client Satisfaction Survey (both carried out at the three study sites as part of a larger valuation of the primary health care renewal initiative) and a review of existing documentation.

Identified through consultations with key stakeholders, benefits expected from the enhancement of ICT in the Connaigre Peninsula primary health care setting include improvements in three areas: team functioning, quality of care and administrative functioning.

While this study was able to detect only a few significant differences in survey responses between sites or over time, trends in the data suggest that enhanced technical capacity had a positive impact on team functioning and coordination of care, particularly through improved access to existing information, such as laboratory results, for patients that are cared for by multiple team members. Specific technology-enabled functions identified as having the greatest impact on team functioning and coordination of care included the ability to access diagnostic images, laboratory results look-up and electronic messaging.

With respect to improved quality of care, findings suggested improvements in a number of areas related to quality of care including documentation, access to information,

adherence to practice guidelines, the ability to make decisions and access to health care services.

Findings also indicate improvements in some areas of administrative functioning for administrative support staff as well as other team members including less duplication of testing, less time spent looking for patient information, decreased time and effort required for some tasks and less unfinished work at the end of the day. The ability to access diagnostic images and laboratory results, as well as electronic appointment scheduling, were perceived to have made the greatest contribution to improved administrative functioning.

User satisfaction with specific technology-enabled functions was also examined. Findings suggested that satisfaction with training, technical support and technical performance varied among functions and that users were most satisfied with, and realized the most benefit from, specific technologies in which training and technical support was considered most adequate. Benefit-to-effort ratios indicate that, for all functions, the perceived benefit outweighed the perceived effort to use it. In the Connaigre Peninsula site, benefit-to-effort ratios were highest for electronic messaging, followed by laboratory results look-up, diagnostic imaging look-up and registration/search and define client lists.

Based on the information available, the project was carried out within the proposed budget. It was not possible to do direct comparisons of expected and actual costs at the item level due to differences in the level of detail of the funding proposal and invoices and status reports received by the project management team.

Several key lessons were identified related to introducing ICT into a primary health care setting and focused on: change management, end user engagement, unforeseen circumstances, training, physician resistance and alignment with other health ICT initiatives. In addition to the lessons learned, important policy issues were identified including the need for a province-wide EHR and clearinghouse to coordinate all major provincial health ICT initiatives, the need for a provincial strategy to address physician resistance to the use of ICT and the need to address barriers to accessing and using ICT to share information between health sectors or jurisdictions.

7.2 Recommendations for Future Research

Important implications for future research related to the impact of ICT in primary health care have emerged from this study:

1) A broad approach to examining the impact of ICT in primary health care was chosen for this study, however more in-depth data collection and analysis is needed to fully understand the impact of specific technology-enabled functions as well as why certain user groups have different experiences with the same technology.

2) In this study, small sample size limited statistical analysis of survey findings. Future research should aim to include larger study populations, perhaps in a multi-jurisdictional study, and further examine the perceived benefits that were identified in this study based on positive trends in the data.

3) Data collection for this study was carried out approximately six months after implementation of the final technical enhancement considered in the 'intervention' for this study. In future research, continuous evaluation beyond six months post-implementation should be considered as findings can change as a result of changes in the environment and users become more experienced with the technology.

4) A number of avenues were explored to engage physicians from the intervention site in the present study, however to no avail. Future studies should consider other measures to engage physicians, such as including a budget item to compensate physicians for taking clinic time to participate in data collection activities such as workshops, interviews and focus groups.

5) While the evaluation approach proposed by Neville et al. (2004) was considered most appropriate for this study, several areas for improvement were identified. It is recommended that the approach be revisited and updated based on practical experience gained through this and other studies that have used the same approach.

7.3 Conclusion

Findings of this comparative case study suggest that, by leveraging existing technologies, a relatively small investment in the enhancement of technical capacity can facilitate improvements in various aspects of team functioning, quality of care and

administrative functioning in a community-model primary health care setting. Along with the lessons learned, study findings can be used by the provincial government, as well as by other sites and jurisdictions, to support the decision to enhance health information and communication technologies in similar primary health care settings. This study also highlights important policy issues that need to be addressed to accelerate the implemention of a province-wide electronic health record. In addition to supporting policy and decision-making, this study contributes new scintific knowledge as few previous studies in primary health care have focused on ICT inititiaves other than EMRs, included multidisciplinary teams as study particpants, or have been carried out in rural, community-model PHC settings or in Canada.

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APPENDIX A: FUNCTIONAL REQUIREMENTS

CATEGORY	FUNCTION(S)	PRIORITY*
Minimum Data Set	Minimum data set for: ▪ demographic data ▪ clinical data	M
Search	Search for client by various combinations of search criteria (e.g. health insurance number, name, DOB, appointment date, etc)	M
Data Viewing	Drill down access to client data based on provider privileges	M
Consolidated Chart	Consolidated client chart/file/record including; ▪ Electronic medical record (EMR) ▪ Immunizations ▪ Active services ▪ Recent tests	M
Standardized Coding	Standardized coding schemes and capabilities including: ▪ physician billing codes • International Classification of Disease codes • Financial codes • Provincial laboratory codes • Management Information Systems (MIS) reporting • National home care reporting standards • Ability to cross reference different coding schemes	M
Alerts	Alert processing including, for example: ▪ various alert channels (e.g. on screen, email, pager) • routine and critical alerts • medical and allergy alerts • reminders based on clients age (e.g. breast screening)	M
System Help	Searchable system/online help, customizable to the organization	M
Security and Access	User access and security requirements including: ▪ Role based access, with emergency override ▪ Single sign on to multiple systems ▪ Auditing of user access • remote access (D)	M/D
Reporting	Reporting capabilities including: ▪ population health indicators ▪ trend analysis ▪ by diagnosis ▪ standard and customizable reports	M (management) D (PHC team)
Lists	Ability to define client lists, for example, by: ▪ appointment date • service type • provider	D

Messaging	Communication/messaging among providers including: ▪ send and store messages in relation to a client • send links to client information (rather than send information itself)	D
Comments	Assignment of comments to existing data and send to other providers via email or other messaging function	H
Access to Resources	Ability to link to support resources internally ad externally (i.e. internet), including: ▪ clinical practice guidelines • internet resources • policies and procedures • best practices • drug interactions and costs • alternative tests and treatments	H
Client Self service	Client self service including: ▪ access to their own electronic record • internet access • links to education resources • support group information with site links • answers to frequently asked questions (FAQ)	H
Data Flagging	Identify/flag data from a source system as relevant and import	Out of Scope
Scheduling	Appointment scheduling	Out of scope
Order Entry	Provider order entry including: ▪ laboratory work • pharmacy • diagnostic imaging • medical equipment and supplies	Out of scope
Uniform Assessment	Uniform assessment tools, for example: ▪ long term care assessment • disease specific assessment (e.g. mental health) • continuing care assessment • financial assessment for home support • various public health assessments • referral forms	Out of scope

***Priority: M = Mandatory, D = Desirable, H = Helpful**

APPENDIX B: INTERVIEW GUIDE, PHASE I

Evaluating Enhanced Information Systems Capacity in Primary Health Care

Primary Heath Care Coordinator Interview Guide

Study I.D. _____ Date: _____

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1. Describe the structure of the Connaigre PHC initiative with respect to:

    a) physical sites included
    b) services provided
    c) team members

2. The next few questions relate to the technical environment.

    a) Which sites have access to the regional Meditech system and to which modules, via what type of connection?

    b) Which sites have access to the regional CRMS system and to which modules, via what type of access?

    c) Using the Capability checklist as a guide, what specific IT functions will be available to primary health care team members as of March 31, 2006. Be sure to indicate approximate date of availability, any differences in availability between sites and whether it is an enhancement received under the Primary Health Care pilot project (Connaigre only).

[Thank you for your time]

Capability Checklist

For each category, please indicate which IT functions will be available to primary health care team members, as of March 31, 2006. Be sure to include approximate date of availability, any differences in availability between sites and whether it is an enhancement received under the Primary Health Care pilot project (Connaigre only). Also include any other important function not listed.

CATEGORY	AVAILABILITY
Minimum Data Set	
Search and Define Client Lists	
Data Viewing	
Clinical Documentation	
Provider Order Entry	
Uniform Tools	
Standardized Coding and capabilities	
Scheduling	
Alerts	
Flagging	
Access to Resources	
Communication Among Providers	
Client/Provider Contact	
Client Self Service	
System Help	
Other	

APPENDIX C: STAKEHOLDER LIST

Key Stakeholders

A list of key stakeholders was compiled as the first step in the development of the evaluation framework. The final list of stakeholders included:

- the provincial Office of Primary Health Care (OPHC) Team Leader, Medical Consultant and staff
- the Newfoundland and Labrador Centre for Health Information Project Manager
- Department of Health and Community Services Executive
- primary health care coordinators and facilitators from across the province
- health IT project managers (e.g. Telehealth, PACS, Pharmacy)
- primary health care team members at each site including physicians, nurses, nurse practitioners, LPNs, social workers, administrative support staff and other allied health professionals
- directors of IT and technical support staff
- the Primary Health Care Information Managament Working Group
- provincial and local primary health care advisory groups
- health system managers and administrators
- researchers interested in the evaluation of information systems initiatives and innovation in primary health care

APPENDIX D: INITIAL CONTACT LETTER, KEY INFORMANT INTERVIEWS, PHASE I

Dear _____:

As you are aware, the _____ *(name of site)* Primary Health Care site has been chosen for inclusion in a study to evaluate the impact of health information systems capacity on team functioning and health care delivery in primary health care settings in Newfoundland and Labrador.

Based on findings from the evaluation framework workshop held on July 21, 2005 and consultations with the Office of Primary Health Care, three key research questions have been identified to address in the evaluation:

1. **What were the costs of implementing the system and how do they compare to projected costs?**

2. **What are the benefits of the system and how to they compare to anticipated benefits?**

    a) Does health information systems capacity impact the perceived functioning, roles and satisfaction levels of primary health care team members?

    b) Does health information systems capacity impact the quality of care in primary care sites?

    c) Does health information systems capacity impact the ease of administration/delivery of health care services?

3. **What are the lessons learned for other Primary Heath Care sites engaging in similar initiatives?**

Description of Study Procedures

The complete study encompasses of a number of data collection strategies including surveys, interviews, observation and documentation review. At this time, we are seeking consent from key individuals to participate in a telephone interview. You will be contacted by the research analyst working on the study to ask for your participation in the study. With your consent, an interview time will be arranged. The interview will be conducted by telephone and will take approximately 1 hour to complete. The interview will be conducted by Mrs. Kayla Collins, co-investigator on the study, with one other member of the study team present to document responses.

Please read the attached document which explains the study procedures in more detail.

Questions:

If you have any questions about taking part in this research, you can meet with, or contact, the Principal Investigator who is in charge of this study at the Faculty of Medicine, Memorial University of Newfoundland. That person is:

Dr. Doreen Neville Phone: 777-6215 e-mail: DNeville@mun.ca.

Thank you very much for taking the time to inform yourself about this study.

Doreen Neville
Kayla Collins

Title: Evaluating the Impact of Enhanced Information Systems Capacity in Primary Health Care in Newfoundland and Labrador

Principal Investigator: Dr. Doreen Neville

Sponsor: Office of Primary Health Care

You have been asked to take part in a research study. It is up to you to decide whether to be in the study or not. Before you decide, you need to understand what the study is for, what risks you might take and what benefits you might receive. This consent form explains the study.

The researchers will:

- Discuss the study with you
- Answer your questions
- Keep confidential any information which could identify you personally
- Be available during the study to deal with problems and answer questions

You may decide not to take part in, or leave the study, at any time.

Background

This study is designed to evaluate the impact of enhanced health information systems capacity on team functioning and health care delivery in a primary health care setting in Newfoundland and Labrador.

Purpose

The purpose of the interview is to gather information regarding the structure of the primary health care initiative with which you are involved and the current technical environment.

Description of the Study Procedures

If you are willing to be interviewed, a research analyst will arrange a time for a telephone interview.

Length of Time

The interview will take approximately 1 hour to complete.

Possible Risks and Discomforts

There are no anticipated risks and discomforts associated with this study. However, participants will be asked to give freely of their time and will be asked to provide honest feedback.

Benefits

It is not known whether this study will benefit you personally.

Liability Statement

You will be contacted by the research analyst working on the study to ask for your participation in the study. If you verbally consent to participate in the study, this tells us that you understand the information about the research study. When you consent to participate, you do not give up your legal rights. Researchers or agencies involved in this research study still have their legal and professional responsibilities.

Confidentiality

By verbally agreeing to participate, you will be giving your permission for the assessment of information that you give during the interview. However, your name will not appear in any report or article published as a result of this study.

Questions

If you have any questions about taking part in this research, you can meet with, or contact, the Principal Investigator who is charge of this study at the Faculty of Medicine, Memorial University of Newfoundland. That person is:

Dr. Doreen Neville Phone: 777-6215 e-mail: DNeville@mun.ca.

Or you can talk to someone who is not involved with the study at all, but can advise you of your rights as a participant in a research study. This person can be reached through the:

Office of the Human Investigative Committee (HIC) at (709) 777-6974 (HIC@mun.ca)

Conflict of Interest Statement

Two co-investigators of this study are employees of the Newfoundland and Labrador Centre for Health Information and therefore may have a particular interest in the success of the study.

APPENDIX E: TELEPHONE SCRIPT #1, KEY INFORMANT INTERVIEWS, PHASE I

Hello Mr. /Ms. _____

This is _____ calling. I am working with Kayla Collins and Dr. Doreen Neville on a study in which we are evaluating the impact of enhanced information and communication systems capacity in a primary health care setting.

Approximately one week ago, you were sent a letter, via email, that describes the study as well as a document that outlines exactly what your participation in the study would entail. As you would have read in those documents, participation in the study is voluntary and confidentiality of all information is ensured.

I am calling now to ask for your participation in the study. This will involve participating in a telephone interview in which you will be asked a series of questions regarding the structure of the primary health care initiative with which you are involved with and the current technical environment. Are you willing to volunteer approximately 45 minutes of your time to participate in the study?

(If the individual agrees to participate) Shall we go ahead and schedule a time for the interview?

Scheduled interview date/time: _____

Thank you very much Mr./Ms. _____. You will be contacted by Mrs. Kayla Collins, a co-investigator on the study, on *(interview date/time)* at which time the interview will take place.

We look forward to speaking with you again.

APPENDIX F: TELEPHONE SCRIPT #2, KEY INFORMANT INTERVIEWS, PHASE I

Hello Mr. /Ms. _____

This is Kayla Collins calling. As _____ indicated I would, when he/she spoke with you previously, I am calling now to ask you a few questions regarding:

(Insert line appropriate to interview being conducted)

- the structure and technical environment of the primary health care initiative that you are involved in.

OR

- your perceptions of the information and communication enhancement project

Before we begin, I want to let you know that _____ *(one other research team member)* is also present and that both of us will be taking notes during the interview.

Do you have any questions before we begin?

(see interview guides for questions to be asked)

(when interview is finished)
Thank you very much Mr./Ms. _____. Your participation and time is very much appreciated.

APPENDIX G: LETTER OF APPROVAL, PHASE I

Memorial
University of Newfoundland

Office of Research and Graduate Studies (Medicine)
Faculty of Medicine
The Health Sciences Centre

November 17, 2005

Reference #05.222

Mrs. Kayla Collins
C/o Dr. Doreen Neville
e-health Research Unit
Faculty of Medicine

Dear Mrs. Collins:

Your application entitled "**Evaluating the impact of enhanced health information systems capacity in a rural primary health care setting in Newfoundland and Labrador**" was reviewed by a Sub-Committee of the Human Investigation Committee and **full approval** was granted.

This will be reported to the full Human Investigation Committee, for their information, at the meeting scheduled for **November 24, 2005**.

Full approval has been granted for one year. You will be contacted for annual update before **November 16, 2006**.

For a hospital-based study, it is **your responsibility to seek the necessary approval from the Health Care Corporation of St. John's and/or other hospital boards as appropriate**.

This Research Ethics Board (the HIC) has reviewed and approved the application for the study which is to be conducted by you as the qualified investigator named above at the specified study site. This approval and the views of this Research Ethics Board have been documented in writing. In addition, please be advised that the Human Investigation Committee currently operates according to the Tri-Council Policy Statement and applicable laws and regulations.

Notwithstanding the approval of the HIC, the primary responsibility for the ethical conduct of the investigation remains with you.

We wish you success with your study.

Sincerely,

John D. Harnett, MD, FRCPC
Co-Chair
Human Investigation Committee

Richard S. Neuman, PhD
Co-Chair
Human Investigation Committee

JDH;RSN\jd

C Dr. C. Loomis, Vice-President (Research), MUN
Mr. W. Miller, Director of Planning & Research, HCCSJ

St. John's, NL, Canada A1B 3V6 • Tel: (709) 777-6762 • Fax: (709) 777-7501 • email: rgs@mun.ca

APPENDIX H: CONSENT FORM, PRE-EVALUATION WORKSHOP

Consent to Take Part in Research
Evaluation Workshop

Title: Evaluating the Impact of Enhanced Health Information Systems Capacity in Primary Health Care Settings in Newfoundland and Labrador

Principal Investigator: Dr. Doreen Neville

Sponsor: Newfoundland and Labrador Centre for Health Information

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You have been asked to take part in a research study. It is up to you to decide whether to be in the study or not. Before you decide, you need to understand what the study is for, what risks you might take and what benefits you might receive. This consent form explains the study.

The researchers will:

- Discuss the study with you
- Answer your questions
- Keep confidential any information which could identify you personally
- Be available during the study to deal with problems and answer questions

You may decide not to take part in or to leave the study at any time.

Introduction

This study will examine the impact of enhanced health information systems capacity on team functioning and health care delivery in primary health care settings in Newfoundland and Labrador.

Purpose

The purpose of this workshop is to help refine the objectives for the study, the appropriate sampling frames and data sources available to address the research questions.

Description of the study procedures

During the workshop, the research team will give you an orientation to the framework and notes will be taken based on the discussions generated. After the workshop, the evaluation will be further developed based on outcomes of the workshop. You may be asked to participate in other components of the study at a later date.

Length of time

You will be asked to give approximately *4 hours* of your time to take part in the workshop.

Possible risks and discomforts

There are no anticipated risks or discomforts associated with this study. However, participants will be asked to give freely of their time and will be asked to provide honest feedback. You are not required to answer any question that you are not comfortable in answering.

Benefits

It is not known whether this study will benefit you personally.

Liability Statement

Signing this form gives us your consent to be in this study. It tells us that you understand the information about the research study. When you sign this form, you do not give up your legal rights. Researchers or agencies involved in this research study still have their legal and professional responsibilities.

Confidentiality

By signing this consent form, you will be giving your permission for the assessment of information that you give during your participation. However, your name will not appear in any report or article published as a result of this study. Your responses will be grouped with that of others and presented in general terms.

Questions

If you have any questions about taking part in this research, you can meet with the Principal Investigator who is in charge of the study at Memorial University of Newfoundland.

That person is:

Dr. Doreen Neville, (709) 777-6215, dneville@mun.ca

Or, you can talk to someone who is not involved with the study at all, but can advise you on your rights as a participant in a research study.

This person can be reached through:

Office of the Human Investigation Committee (HIC), (709) 777-6974, hic@mun.ca

Signature Page

Study Title: Evaluating the Impact of Enhanced Health Information Systems Capacity in Primary Health Care Settings in Newfoundland and Labrador

Name of Principal Investigator: Dr. Doreen Neville

To be filled out and signed by the participant:

Please check as appropriate.

I have read the information sheet	Yes □ No □
I have had the opportunity to ask questions/to discuss this study	Yes □ No □
I have received satisfactory answers to all of my questions	Yes □ No □
I have received enough information about the study	Yes □ No □
I have spoken with a qualified member of the study team	Yes □ No □
I understand that I am free to withdraw from the study • At any time • Without having to give a reason	Yes □ No □
I understand that it is my choice to be in the study and I may not benefit	Yes □ No □
In agree to take part in this study	Yes □ No □

_____ _____

Signature of participant Date

_____ _____

Signature of witness Date

To be signed by the investigator:

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

_____ _____

Signature of investigator Date

APPENDIX I: LIST OF INDICATOR AREAS

Broad Areas		Indicator Areas
Benefits	Team Functioning	• Communication among primary health care team members • Communication between primary health care team members and secondary/tertiary care providers • Scope of practice/level of skills maximisation • Provider role satisfaction • Coordination of care
	Administrative Functioning/ Service Delivery	• Occurrence of duplicate testing (laboratory, DI, etc) • Documentation effort • Productivity • Quality of work day • System usability - efficiency of access - user friendliness - training and support
	Quality of Care	• Provider access to information within and outside primary health care team • Documentation completeness & accuracy • Continuity of care • Timeliness of information availability • Occurrence of errors and adverse events • Patient/client access to information/services • Patient satisfaction
Costs		• Technology (hardware, software, networking, etc) • Capital • Maintenance • Personnel • Training/user support
Lessons Learned		• Key facilitators and barriers to success • Characteristics of champions for technology • Unexpected consequences • Value of needs assessment • Change management requirements

APPENDIX J: PRIMARY HEALTH CARE TEAM SURVEY

EVALUATING ENHANCED INFORMATION SYSTEMS CAPACITY IN PRIMARY HEALTH CARE

Primary Health Care Team Survey

You are invited to take part in a survey of Primary Health Care providers, including physicians, nurses, LPNs, nurse practitioners, social workers, administrative support and other allied health professionals.

Three primary health care team areas are included in this study, each with varying degrees of information and communication systems capacity:

1) Connaigre Peninsula
2) Twillingate/New World Island
3) Bonne Bay

In the first part of the survey, we will be asking you to compare your current experiences in primary health care to your experiences before the Primary Health Care Initiative (approximately 2 years ago). The second part of the survey focuses on specific functions that are enabled through the use of technology.

Please note that throughout the survey, the term 'client' is used to refer to patient and/or client.

Primary health care (as defined by Health Canada) refers to basic, everyday health care. Primary health care could be visiting the family doctor or nurse practitioner, talking to a dietician or a pharmacist, or calling a toll-free health advice line to talk to a health professional. It is usually your first encounter with a health care provider when you need care or advice.

Primary Health Care Team Survey

A. In the first section, you will be asked to respond to a series of general statements about your current experiences in primary health care in comparison to your experiences before the primary health care initiative (approximately 2 years ago).

Using a scale of 1 to 5, where **1 = strongly disagree** and **5 = strongly agree**, please indicate the extent to which you agree or disagree with the following statements about this function. Indicate NA if not applicable.

1. Compared to before the PHC initiative (approx 2 years ago):

Communication with other providers within my PHC team has improved	1	2	3	4	5	NA
Communication with other providers outside my PHC team has improved	1	2	3	4	5	NA
Coordination of client care with providers within my PHC Team has improved	1	2	3	4	5	NA
Coordination of client care with providers outside my PHC Team has improved	1	2	3	4	5	NA
There is less duplication of data collection (i.e. clinical or other information related to your client)	1	2	3	4	5	NA
The quality of my workday has improved	1	2	3	4	5	NA
I see more clients per day	1	2	3	4	5	NA
I spend less time locating client information	1	2	3	4	5	NA
I have less unfinished work at the end of the workday	1	2	3	4	5	NA
I have more information on individual clients	1	2	3	4	5	NA
I have more information on the population(s) to which I deliver care as a whole	1	2	3	4	5	NA
I have a more complete client chart	1	2	3	4	5	NA
The timeliness of referrals have improved	1	2	3	4	5	NA
Referral documents (that you compile and/or receive) are more complete	1	2	3	4	5	NA
I have more information about my clients visits to providers within my PHC Team	1	2	3	4	5	NA
I have more information about my clients visits to providers outside my PHC Team	1	2	3	4	5	NA
I have all information about my clients that is important to their care	1	2	3	4	5	NA
Clients seem more satisfied with the care they receive	1	2	3	4	5	NA
I am better able to make decisions about client care	1	2	3	4	5	NA
Patient/client safety has improved	1	2	3	4	5	NA
I am able to act on test results in a more timely fashion	1	2	3	4	5	NA
There is less duplication of testing	1	2	3	4	5	NA
The quality of client-provider interactions have improved	1	2	3	4	5	NA
The security of client information has improved	1	2	3	4	5	NA
In-office/clinic wait time has decreased	1	2	3	4	5	NA
I am better able to adhere to clinical practice guidelines	1	2	3	4	5	NA
I save time on specific tasks throughout the day (e.g. scheduling appointments, looking for client information, etc)	1	2	3	4	5	NA
I spend more time on specific tasks throughout the day (e.g. scheduling appointments, looking for client information, etc)	1	2	3	4	5	NA

B. In the next section, please refer to the function listed above each box in BOLD when responding to the items that follow. If the function is not relevant to your role as a PHC provider, please circle N/A (to the right) and move on to the next function. **If the function is relevant to your role,** regardless of whether you have access to it or use it, please respond to each item.

I. ELECTRONIC CHARTING (excluding electronic flow sheet for diabetes management) **N/A**

2a) Do you have access to this function? ❍Yes ❍No

b) If yes, where are you able to access this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Private or semi-private office
- ❍ Home office
- ❍ Other (please specify) _____

3a) Do you use this function? ❍Yes ❍No

b) If yes, where do you use this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

4) Briefly comment on how you use this function

_____

5) Using a scale of 1 to 5, where **1 = strongly disagree** and **5 = strongly agree**, please indicate the extent to which you agree or disagree with the following statements about this function. Indicate NA if not applicable.

Training was sufficient	1	2	3	4	5	NA
Technical support is adequate	1	2	3	4	5	NA
System performance is adequate	1	2	3	4	5	NA
System downtime is acceptable	1	2	3	4	5	NA
System downtime is non-disruptive to workflow	1	2	3	4	5	NA
It is easy to use	1	2	3	4	5	NA
I have adequate access	1	2	3	4	5	NA
It has a positive impact on team functioning	1	2	3	4	5	NA
It has a positive impact on the coordination of care	1	2	3	4	5	NA
It has a positive impact on administrative functioning/workflow	1	2	3	4	5	NA
It meets my needs	1	2	3	4	5	NA
If given the choice, I would return to the old way of working	1	2	3	4	5	NA

6a) On a scale of 1 to 10, where **1 = very little effort** and **10 = a great deal of effort**, how would you rate the effort required to use this function? _____

b) On a scale of 1 to 10, where **1 = very little benefit** and **10 = a great deal of benefit**, how would you rate the benefit(s) of this function? _____

II. ELECTRONIC APPOINTMENT SCHEDULING N/A

7a) Do you have access to this function? ❍Yes ❍No

b) If yes, where are you able to access this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

8a) Do you use this function? ❍Yes ❍No

b) If yes, where do you use this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Centre/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

9) Briefly comment on how you use this function

_____

10) Using a scale of 1 to 5, where **1 = strongly disagree** and **5 = strongly agree**, please indicate the extent to which you agree or disagree with the following statements about this function. Indicate NA if not applicable.

Training was sufficient	1	2	3	4	5	NA
Technical support is adequate	1	2	3	4	5	NA
System performance is adequate	1	2	3	4	5	NA
System downtime is acceptable	1	2	3	4	5	NA
System downtime is non-disruptive to workflow	1	2	3	4	5	NA
It is easy to use	1	2	3	4	5	NA
I have adequate access	1	2	3	4	5	NA
It has a positive impact on team functioning	1	2	3	4	5	NA
It has a positive impact on the coordination of care	1	2	3	4	5	NA
It has a positive impact on administrative functioning/workflow	1	2	3	4	5	NA
It meets my needs	1	2	3	4	5	NA
If given the choice, I would return to the old way of working	1	2	3	4	5	NA

11a) On a scale of 1 to 10, where **1 = very little effort** and **10 = a great deal of effort**, how would you rate the effort required to use this function? _____

b) On a scale of 1 to 10, where **1 = very little benefit** and **10 = a great deal of benefit**, how would you rate the benefit(s) of this function? _____

III. ELECTRONIC SEARCH AND DEFINE CLIENT LISTS (REGISTRATION) N/A

12a) Do you have access to this function? ❍Yes ❍No

b) If yes, where are you able to access this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

13a) Do you use this function? ❍Yes ❍No

b) If yes, where do you use this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

14) Briefly comment on how you use this function

_____

15) Using a scale of 1 to 5, where **1 = strongly disagree** and **5 = strongly agree**, please indicate the extent to which you agree or disagree with the following statements about this function. Indicate NA if not applicable.

Training was sufficient	1	2	3	4	5	NA
Technical support is adequate	1	2	3	4	5	NA
System performance is adequate	1	2	3	4	5	NA
System downtime is acceptable	1	2	3	4	5	NA
System downtime is non-disruptive to workflow	1	2	3	4	5	NA
It is easy to use	1	2	3	4	5	NA
I have adequate access	1	2	3	4	5	NA
It has a positive impact on team functioning	1	2	3	4	5	NA
It has a positive impact on the coordination of care	1	2	3	4	5	NA
It has a positive impact on administrative functioning/workflow	1	2	3	4	5	NA
It meets my needs	1	2	3	4	5	NA
If given the choice, I would return to the old way of working	1	2	3	4	5	NA

16a) On a scale of 1 to 10, where **1 = very little effort** and **10 = a great deal of effort**, how would you rate the effort required to use this function? _____

b) On a scale of 1 to 10, where **1 = very little benefit** and **10 = a great deal of benefit**, how would you rate the benefit(s) of this function? _____

IV. ELECTRONIC VIEWING OF LAB RESULTS N/A

17a) Do you have access to this function? ❍Yes ❍No

b) If yes, where are you able to access this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

18a) Do you use this function? ❍Yes ❍No

b) If yes, where do you use this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

19) Briefly comment on how you use this function

_____

20) Using a scale of 1 to 5, where **1 = strongly disagree** and **5 = strongly agree**, please indicate the extent to which you agree or disagree with the following statements about this function. Indicate NA if not applicable.

Training was sufficient	1	2	3	4	5	NA
Technical support is adequate	1	2	3	4	5	NA
System performance is adequate	1	2	3	4	5	NA
System downtime is acceptable	1	2	3	4	5	NA
System downtime is non-disruptive to workflow	1	2	3	4	5	NA
It is easy to use	1	2	3	4	5	NA
I have adequate access	1	2	3	4	5	NA
It has a positive impact on team functioning	1	2	3	4	5	NA
It has a positive impact on the coordination of care	1	2	3	4	5	NA
It has a positive impact on administrative functioning/workflow	1	2	3	4	5	NA
It meets my needs	1	2	3	4	5	NA
If given the choice, I would return to the old way of working	1	2	3	4	5	NA

21a) On a scale of 1 to 10, where **1 = very little effort** and **10 = a great deal of effort**, how would you rate the effort required to use this function? _____

b) On a scale of 1 to 10, where **1 = very little benefit** and **10 = a great deal of benefit**, how would you rate the benefit(s) of this function? _____

V. VIEWING DIGITAL IMAGES

N/A

22a) Do you have access to this function? ❍Yes ❍No

b) If yes, where are you able to access this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

23a) Do you use this function? ❍Yes ❍No

b) If yes, where do you use this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

24) Briefly comment on how you use this function

_____

25) Using a scale of 1 to 5, where **1 = strongly disagree** and **5 = strongly agree**, please indicate the extent to which you agree or disagree with the following statements about this function. Indicate NA if not applicable.

Training was sufficient	1	2	3	4	5	NA
Technical support is adequate	1	2	3	4	5	NA
System performance is adequate	1	2	3	4	5	NA
System downtime is acceptable	1	2	3	4	5	NA
System downtime is non-disruptive to workflow	1	2	3	4	5	NA
It is easy to use	1	2	3	4	5	NA
I have adequate access	1	2	3	4	5	NA
It has a positive impact on team functioning	1	2	3	4	5	NA
It has a positive impact on the coordination of care	1	2	3	4	5	NA
It has a positive impact on administrative functioning/workflow	1	2	3	4	5	NA
It meets my needs	1	2	3	4	5	NA
If given the choice, I would return to the old way of working	1	2	3	4	5	NA

26a) On a scale of 1 to 10, where **1 = very little effort** and **10 = a great deal of effort**, how would you rate the effort required to use this function? _____

b) On a scale of 1 to 10, where **1 = very little benefit** and **10 = a great deal of benefit**, how would you rate the benefit(s) of this function? _____

VI. ELECTRONIC MESSAGING (e.g. email, Meditech messaging, etc) N/A

27a) Do you have access to this function? ❍Yes ❍No

b) If yes, where are you able to access this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

28 a) Do you use this function? ❍Yes ❍No

b) If yes, where do you use this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

29) Briefly comment on how you use this function

_____

_____

30) Using a scale of 1 to 5, where **1 = strongly disagree** and **5 = strongly agree**, please indicate the extent to which you agree or disagree with the following statements about this function. Indicate NA if not applicable.

Training was sufficient	1	2	3	4	5	NA
Technical support is adequate	1	2	3	4	5	NA
System performance is adequate	1	2	3	4	5	NA
System downtime is acceptable	1	2	3	4	5	NA
System downtime is non-disruptive to workflow	1	2	3	4	5	NA
It is easy to use	1	2	3	4	5	NA
I have adequate access	1	2	3	4	5	NA
It has a positive impact on team functioning	1	2	3	4	5	NA
It has a positive impact on the coordination of care	1	2	3	4	5	NA
It has a positive impact on administrative functioning/workflow	1	2	3	4	5	NA
It meets my needs	1	2	3	4	5	NA
If given the choice, I would return to the old way of working	1	2	3	4	5	NA

31a) On a scale of 1 to 10, where **1 = very little effort** and **10 = a great deal of effort**, how would you rate the effort required to use this function? _____

b) On a scale of 1 to 10, where **1 = very little benefit** and **10 = a great deal of benefit**, how would you rate the benefit(s) of this function? _____

VII. VIDEOCONFERENCING

N/A

32a) Do you have access to this function? ❍Yes ❍No

b) If yes, where are you able to access this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

33a) Do you use this function? ❍Yes ❍No

b) If yes, where do you use this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

34) Briefly comment on how you use this function

_____

_____

35) Using a scale of 1 to 5, where **1 = strongly disagree** and **5 = strongly agree**, please indicate the extent to which you agree or disagree with the following statements about this function. Indicate NA if not applicable.

Training was sufficient	1	2	3	4	5	NA
Technical support is adequate	1	2	3	4	5	NA
System performance is adequate	1	2	3	4	5	NA
System downtime is acceptable	1	2	3	4	5	NA
System downtime is non-disruptive to workflow	1	2	3	4	5	NA
It is easy to use	1	2	3	4	5	NA
I have adequate access	1	2	3	4	5	NA
It has a positive impact on team functioning	1	2	3	4	5	NA
It has a positive impact on the coordination of care	1	2	3	4	5	NA
It has a positive impact on administrative functioning/workflow	1	2	3	4	5	NA
It meets my needs	1	2	3	4	5	NA
If given the choice, I would return to the old way of working	1	2	3	4	5	NA

36a) On a scale of 1 to 10, where **1 = very little effort** and **10 = a great deal of effort**, how would you rate the effort required to use this function? _____

b) On a scale of 1 to 10, where **1 = very little benefit** and **10 = a great deal of benefit**, how would you rate the benefit(s) of this function? _____

VIII. ELECTRONIC FLOW SHEET FOR DIABETES MANAGEMENT N/A

37a) Do you have access to this function? ❍Yes ❍No

b) If yes, where are you able to access this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Private or semi-private office
- ❍ Home office
- ❍ Other (please specify) _____

38a) Do you use this function? ❍Yes ❍No

b) If yes, where do you use this function? (Check all that apply)

- ❍ Point of care (e.g. exam room, home visit, etc.
- ❍ Health Center/clinic in central location (e.g. reception area, meeting room, etc.)
- ❍ Office (private or semi-private)
- ❍ Home
- ❍ Other (please specify) _____

39) Briefly comment on how you use this function

_____

_____

40) Using a scale of 1 to 5, where **1 = strongly disagree** and **5 = strongly agree**, please indicate the extent to which you agree or disagree with the following statements about this function. Indicate NA if not applicable.

Training was sufficient	1	2	3	4	5	NA
Technical support is adequate	1	2	3	4	5	NA
System performance is adequate	1	2	3	4	5	NA
System downtime is acceptable	1	2	3	4	5	NA
System downtime is non-disruptive to workflow	1	2	3	4	5	NA
It is easy to use	1	2	3	4	5	NA
I have adequate access	1	2	3	4	5	NA
It has a positive impact on team functioning	1	2	3	4	5	NA
It has a positive impact on the coordination of care	1	2	3	4	5	NA
It has a positive impact on administrative functioning/workflow	1	2	3	4	5	NA
It meets my needs	1	2	3	4	5	NA
If given the choice, I would return to the old way of working	1	2	3	4	5	NA

41a) On a scale of 1 to 10, where **1 = very little effort** and **10 = a great deal of effort**, how would you rate the effort required to use this function? _____

b) On a scale of 1 to 10, where **1 = very little benefit** and **10 = a great deal of benefit**, how would you rate the benefit(s) of this function? _____

C. In the last section, please respond to each item in the space provided, omitting any question(s) that you are uncomfortable with.

42. Where is your PHC team based?

Bonne Bay ☐

Connaigre Peninsula ☐

Twillingate/NWI ☐

43. Which of the following best describes your current position:

Administrative Support ☐ Community Health Nurse ☐

Licensed Practical Nurse ☐ Physician ☐

Registered Nurse ☐ Social Worker ☐

Nurse Practitioner ☐

Other (please specify) _____

44. How long have you worked in this position?

<2 years ☐ 2-4 years ☐ 5-9 years ☐ 10-19 years ☐ 20+ years ☐

45. Please indicate your age range

<30 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ 60+ ☐

46. Please indicate your gender Male ☐ Female ☐

47. Do you have a computer in your home? Yes ☐ No ☐

48. Are there any additional comments that you would like to make regarding the impact of information and communication systems capacity in primary health care?

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for volunteering your time to complete the survey.

APPENDIX K: FOCUS GROUP GUIDE

Focus Group Guide

These questions will be posed following a short presentation that will provide a study overview and status report.

1. During the evaluation framework workshop held in July of 2005, the following potential benefit areas were identified:

- Team Functioning
- Quality of Care
- Administrative Functioning/Service Delivery

Now that enhancements have been received, what impact do you think the enhancements are having on each of these potential benefit areas?

2. During (and following) the implementation of the various pieces of technology, what were some of the challenges encountered (if any)? What helped it go well?

3. Given that the information and communication systems enhancements received were based on consultations with key stakeholders, are there any gaps in functionality that still exist?

APPENDIX L: INTERVIEW GUIDES, PHASE II

Evaluating Enhanced Information Systems Capacity in Primary Health Care
IT Director Interview Guide

Study I.D. _____ Date: _____

---

1) What do you feel are the major benefits resulting from the information and communication enhancement project?

2) What limitations or gaps, if any, exist with respect to enhancements received?

3) Has there been any unintended consequences, positive or negative, as a result of the enhancement received?

4) What aspects of implementation went well?

5) What aspects of the implementation were challenging, or could have been improved?

6) Briefly describe the approach taken to the training of staff to use the new systems. How well did this approach work?

7) What take away messages or lessons learned would you consider important for other Primary Health Care sites undertaking a similar project?

8) Do you have any other comments or feedback that you would like to add?

THANK YOU FOR YOUR PARTICIPATION

Evaluating Enhanced Information Systems Capacity in Primary Health Care
Primary Heath Care Coordinator Interview Guide

Study I.D. _____ Date: ___ _____

---

1) What do you feel are the major benefits resulting from the information and communication enhancement project?

2) What limitations or gaps, if any, exist with respect to the enhancements received?

3) Has there been any unintended consequences, positive or negative, as a result of the enhancement received?

4) What aspects of implementation went well?

5) What aspects of the implementation were challenging, or could have been improved?

6) What change management issues, if any, has resulted from the implementation of the various systems and how are they being addressed? In particular,

   a) What support structures were in place during implementation? (i.e. leadership and funding)
   b) What privacy protocols have been developed or adopted regarding the collection, storage and exchange of electronic patient/client information? (i.e. policies an standards)
   c) What back-up procedures/recovery plans are in place?

7) Are there any resource (financial, personnel, etc.) efficiencies or inefficiencies resulting from the information and communication enhancement project?

8) What take away messages or lessons learned would you consider important for other Primary Health Care sites undertaking a similar project?

9) Do you have any other comments or feedback that you would like to add?

THANK YOU FOR YOUR PARTICIPATION

Evaluating Enhanced Information Systems Capacity in Primary Health Care

Community Health Providers Interview Guide

Study I.D. _____ Date: _____

---

1) Among the information system enhancements received in the Connaigre Primary Health Care Team area, what functional capabilities are available to you?

2) What do you feel are the major benefits resulting from these enhancements?

3) What limitations or gaps, if any, exist with respect to these enhancements?

4) What aspects of implementation went well?

5) What aspects of the implementation were challenging, or could have been improved?

6) Briefly describe the approach taken to training. How well did this approach work?

7) What take away messages or lessons learned would you consider important for other Primary Health Care sites undertaking a similar project?

8) Do you have any other comments or feedback that you would like to add?

THANK YOU FOR YOUR PARTICIPATION

APPENDIX M: TEAM EFFECTIVENESS/SCOPE OF PRACTICE SURVEY

Newfoundland and Labrador Primary Health Care Renewal Initiative

PHC Team Survey: Team Effectiveness/Scope of Practice

As part of the Primary Health Care (PHC) Renewal Initiative, the Office of Primary Health Care is working with local PHC Project representatives to conduct an evaluation of the project. Harry Cummings and Associates (HCA), an evaluation consulting firm, is acting as a neutral third party in providing technical support and assisting with data analysis.

The Office of Primary Health Care is asking team members involved with the Primary Health Care Project to participate in the assessment by completing this questionnaire. **Part A** of this questionnaire will assess key elements of Teamwork including team purpose and vision, communication, team support, and partnerships. **Part B** of this questionnaire will assess Scope of Practice issues including team member role, and service delivery.

Team member participation is voluntary. Once the questionnaire is completed it should be forwarded to Harry Cummings and Associates using the enclosed self-addressed envelope. HCA will compile the information into an electronic data base for analysis. Information received by HCA will be kept confidential. Data will be aggregated and information will be sued in a nameless, summarized form. Under no circumstances will information about an individual respondent be shared with the Department of Health and Community Services.

The information you provide will help keep track of the progress of the project and its impact on service providers and the wider community. Summary information from the data analysis will be shared with the PHC Team through the Project Coordinator.

For the purposes of completing this questionnaire, the following definitions are to be used:

Primary Health Care Team:	Full Time, Part Time, and Casual professionals who provide service for the population of the Bonne Bay region.
Primary Health Care Network:	All board and private professionals who provide service to the population in the Bonne Bay region on an intermittent basis.
Physician Network:	Family Practice Physicians providing medical services to the service population in the Bonne Bay region.

When responding to 'team' related questions, please use the attached membership list as your reference point- this will help to ensure that there is a consistent understanding of the team composition across all team members.

If you have any questions related to the survey, please contact xxxxxxxxx or xxxxxxxxxx at xxxxxxxxxxx.

Part A: Teamwork

Using a scale of 1 to 7 where 1 = strongly disagree and 7 = strongly agree, please indicate the extent to which you disagree or agree with each of the following opinion statements as they relate to your PHC Team. Please note, the questionnaire is designed to be scanned electronically for data entry and it is important that you clearly mark your response in the appropriate box.

If you feel that a statement is not applicable, please check 'N/A'. Check only one box per statement.

		Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7	
A. TEAM PURPOSE AND VISION									
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q1	Our purpose is clearly understood by all members.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q2	We meet regularly for planning.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q3	Our goals and objectives are ***not*** set based on assessment of clients'/patients'/ communities' need.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q4	We do ***not*** have shared common agreement about our strategies to achieve our goals and objectives.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q5	Our goals and objectives are clear.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q6	Our goals and objectives are measurable.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q7	Our goals and objectives are realistic.	☐	☐	☐	☐	☐	☐	☐	☐

		Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7	
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q8	Our team reviews its current effectiveness.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q9	We measure progress against specified goals and objectives.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q10	Overall, there is a clearly understood purpose and vision.	☐	☐	☐	☐	☐	☐	☐	☐

B. COMMUNICATION

		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q11	Communication during our meetings is effective.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q12	Communication between scheduled meetings is effective.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q13	Relevant information is exchanged among team members.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q14	Relevant information is exchanged in a timely fashion.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q15	There is limited duplication of communication within our team.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q16	We effectively use technology to maximize team communications.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q17	Our team does ***not*** have an evidence-based decision-making process.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q18	Decisions are ***not*** followed through to	☐	☐	☐	☐	☐	☐	☐	☐

		Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7	
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q19	Leadership is shared and effectively delegated in line with areas of competence.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q20	Our team members are open and honest when communicating.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q21	When differences occur, they are dealt with effectively.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q22	Overall, I would say I "know" my Primary Health Care Team.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q23	Overall, I am satisfied with Primary Health Care Team-related communications.	☐	☐	☐	☐	☐	☐	☐	☐

C. TEAM SUPPORT

		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q24	There is a high level of trust and confidence amongst our team members.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q25	Our team works as a cohesive group.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q26	Our team provides support to individual members through difficult situations.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q27	We feel comfortable providing feedback to each other when expectations are met.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q28	We feel comfortable providing feedback to each other when expectations are not met.	☐	☐	☐	☐	☐	☐	☐	☐

		Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7	
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q29	Our team members do ***not*** have the opportunity to develop their skills within the team.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q30	Strategies are ***not*** in place to support team development.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q31	We are individually accountable for our team's performance.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q32	We are jointly accountable for our team's performance.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q33	Our team has the support of the regional health board(s) management.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q34	Overall, I am satisfied with the support that team members provide.	☐	☐	☐	☐	☐	☐	☐	☐

D. PARTNERSHIPS

		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q35	Our team involves and supports the community in the planning and delivery of programs and services.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q36	Our team responds to client/patient and community input.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q37	Our team does ***not*** effectively involve network providers.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q38	Our team has developed partnerships with intersectoral groups to plan and deliver services (e.g., education, youth, seniors, police, clergy).	☐	☐	☐	☐	☐	☐	☐	☐

		Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7	
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q39	Committees such as project planning or community advisory committees are supporting the team in improving the delivery of services.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q40	In the past six months, there has been increased participation by clients/patients in decisions related to self, family and community programs.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q41	In the past six months, requests for health information by clients/patients and community members has increased.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q42	Overall, I am satisfied with the partnerships that the Primary Health Care Team has established.	☐	☐	☐	☐	☐	☐	☐	☐

E. PERSONAL SATISFACTION

Please indicate the extent to which you disagree or agree with each of the following opinion statements as they relate to your personal experience.

		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q43	Team meetings contribute to my ability to meet client/patient needs.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q44	I would encourage other health care service providers to work in this practice setting.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q45	Overall, I am satisfied with the functioning of my Primary Health Care Team.	☐	☐	☐	☐	☐	☐	☐	☐

Part B: Scope of Practice

Please indicate the extent to which you disagree or agree with each of the following opinion statements as they relate to your PHC Team.

If you feel that a statement is not applicable, please check 'N/A'. Check only one box per statement.

		Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7	
A.	**ROLES**								
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q46	Members of our team are clear on what is expected of them.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q47	Members of our team understand their role within the team.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q48	Each member of our team respects the insights, knowledge and perspectives brought by members of professions other than his/her own.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q49	Each member's abilities, knowledge and experience are fully utilized by the team.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q50	Our team does ***not*** have the support of the regional health board(s) management.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q51	Service is being delivered through the appropriate providers (i.e. there is a good match between client/patient needs and provider skills).	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q52	Team-based functions are shared across professional boundaries.	☐	☐	☐	☐	☐	☐	☐	☐

		Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7	
B.	**SERVICE DELIVERY**	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q53	Our team covers the continuum of services from prevention to rehabilitation.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q54	Our team spends an appropriate amount of time planning and delivering preventative programs.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q55	Our team does ***not*** do community outreach.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q56	Our team has membership from all relevant groups or professions needed to maximize our ability to function effectively.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q57	Our team is innovative in its service delivery approach.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q58	Our team is clear on how it provides its services.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q59	Practice protocols are in place for key conditions (e.g., diabetes, child development), mapping client/patient flow, provider tasks, information capture and check points.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q60	We use common client/patient records/charts where possible.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q61	We efficiently screen/triage clients/ patients at the point of entry to service.	☐	☐	☐	☐	☐	☐	☐	☐

		Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7	
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q62	Practice information is ***not*** reviewed at our team meetings to improve indicators of service quality.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q63	Working as a team has resulted in service delivery being more integrated and co-ordinated.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q64	Distinct new programs emerge from the collective work of colleagues from different disciplines.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q65	Working with colleagues from other disciplines leads to outcomes that we could not achieve alone.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q66	Organizational protocols reflect the existence of cooperation between professionals from different disciplines.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q67	Overall, I am satisfied with the level of coordination between team members and network service providers.	☐	☐	☐	☐	☐	☐	☐	☐

C. PERSONAL SATISFACTION

Please indicate the extent to which you disagree or agree with each of the following opinion statements as they relate to your personal experience.

		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q68	Other professionals in my practice setting utilize my professional expertise for a range of tasks.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q69	My colleagues from other disciplines believe that they could not do their jobs as well without my assistance.	☐	☐	☐	☐	☐	☐	☐	☐

		Strongly Disagree 1	2	3	4	5	6	Strongly Agree 7	
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q70	Incorporating the views of treatment held by my colleagues from other disciplines improves my ability to meet client/patient needs.	☐	☐	☐	☐	☐	☐	☐	☐
		1	*2*	*3*	*4*	*5*	*6*	*7*	*N/A*
Q71	My scope of practice is being fully utilized within my practice setting.	☐	☐	☐	☐	☐	☐	☐	☐

Q72 Do you have any comments that you would like to provide in relation to the effectiveness of your Primary Health Care Team? (Please attach a separate page if more space is required).

Q73 Do you have any additional comments that you would like to provide in relation to the local Primary Health Care initiative? (Please attach a separate page if more space is required).

The following questions are intended to assist the evaluators in developing a general profile of the Primary Health Care Team. Feel free to omit any questions that you feel are inappropriate.

Q74 What is the name of the Primary Health Care project that you are involved with?

Bonavista..... ☐ *Labrador East*..... ☐

Bonne Bay Region..... ☐ *St. John's Region*..... ☐

Connaigre Peninsula..... ☐ *Twillingate/New World Island*..... ☐

Q75 Grenfell Region

Forteau..... ☐ *Flower's Cove*..... ☐

Roddickton..... ☐ *St. Anthony*..... ☐

Q76 Today's Date: (yy/mm/dd)

Q77 Which of the following roles best describes your position with the Primary Health Care Project? (Check one response only): I'm a member of the...

Primary Health Care Team..... ☐ *Primary Health Care Network*..... ☐

Physician Network..... ☐ *Don't know*..... ☐

Q78 During the last 6 months... ☐ **Don't Know**..... ☐

(a) How many meetings were conducted by the Primary Health Care Team? (Please indicate the actual number).....

And (b) How many of these meetings did you attend in person or by tele- or video-conference? (Please indicate the actual number.)

Q79 *Number of times attended in person*..... ☐

Q80 *Number of times attended by teleconference*..... ☐

Q81 *Number of times attended by video-conference*..... ☐

Q82 *Total number of meetings that you attended*..... ☐

Q83 What is the highest level of education that you completed? (Check one response only.)

Less than high school..... ☐ *Some university*..... ☐

Secondary (high) school

Graduation..... ☐ *(e.g. B.A., B. Sc., B.S.W)*..... ☐

Some non-university trades

certificate or diploma..... ☐ *Completed Master's degree or*

Doctoral degree (e.g. M.A., M.Sc.,

Completed non-university trades

Ph.D., M.D., D.D.S.)..... ☐

certificate or diploma..... ☐.

Q84 **What is your current health related profession? (e.g. Family Doctor, Dentist, Physiotherapist, Nurse Practitioner, Social Worker, Administrator, etc.)**

		Male	*Female*
Q85	**Gender**	☐	☐

Q86 **In what year were you born?**

Thank you for taking the time to complete this questionnaire.

Before mailing the questionnaire to Harry Cummings and Associates please take a moment to ensure that you have completed each page of the questionnaire.

APPENDIX N: CLIENT SATISFACTION SURVEY

May 2006

Client/Patient Telephone Survey for _____ *(name of PHC Project)*

Respondent #: _____ ***Target number for total females:*** ____
Male ☐ Female ☐ ***Target number for total males:*** ____

Total males interviewed to date: ____ ***Total females interviewed to date:*** ____

Record the number of attempts made to reach the respondent. Do not leave a message on the voice machine. With each successive attempt, try to call on a different day of the week and/or at a different time of day. If no contact can be made with the respondent after 3 attempts, record the number and name as a non-response on the data sheet. This will allow us to track response rates. It is important that we try and collect an equal number of responses from men and women. Please refer to the desired target numbers.

Hello, my name is _____ and I'm conducting a survey on behalf of _____ ***(name of organization)***.

Could I speak with someone in the house who is 18 years of age or older?

I've been hired by the Office of Primary Health Care as an independent researcher.

We're doing a short survey to help us know how well our health and social services are meeting the needs of the community.

1. Would you be interested in participating in a short survey that takes about 15 minutes?

1 ☐ *If the response is **'yes'** - proceed to question #2.*

2 ☐ If the response is **'yes, but not at this time'** - arrange a convenient day and time to call back and follow-up accordingly.

3 ☐ *If the response is **'no'** – mention one more time the importance of this information to improve health services in the region – if the response remains **'no'** - thank the respondent for his/her time and terminate the survey.*

4 ☐ *If the response is **'no, I completed a health survey last year'** – indicate that we would still like to get their input because we want to look at changes over time. If the response remains **'no'** - thank the respondent for his/her time and terminate the survey.*

2. We're focusing on people who have used or tried to use health services in _____ *(name of region)* within the last year.

Have you used or tried to use health services in _____ *(name of region)* within the last year?

This could include health service providers such as a family doctor, dentist, physiotherapist, nurse, ambulance attendant, dietitian, social worker, community service provider, etc. *(Note to surveyor - use titles that are most common to the region).*

1 ☐ Yes, the respondent has used or tried to use health services
(Go to question 3)

2 ☐ No, the respondent has not used or tried to use health services
(Thank the respondent for his/her interest in the survey and terminate the survey)

Before we start, I want to assure you that the information you provide will remain confidential. The information will be grouped with other responses from across the region, and no names will be shown. The results from the survey will be used to help improve the delivery of primary health care services in the region. Your participation is voluntary. If you feel uncomfortable with any question, you do not have to answer it.

Do you have any questions before we begin? If you wish to speak with someone who can provide more detailed information about this survey you can contact _____.

(Provide the name of the Project Coordinator and his/her contact phone number.)

***Record the interview start time*: _____ 1 ☐am / 2 ☐pm**

I'd like to start by asking you a few questions about the types of health and social services that you recently used or tried to use.

3. To begin with, can you tell me if you have a regular family doctor?

1 ☐ Yes *(go to question 4)*
2 ☐ No *(go to question 5)*

(Note to surveyor – We are specifically asking if the respondent has a regular family doctor, this does not include a nurse practitioner or other regular health service provider that they have.)

4. How long on average would it take you to travel from your home to see your family doctor?

Please specify the number of: ***Minutes*** ☐ ***Hours*** ☐ ***Days*** ☐

5. During the last year what types of health service providers have you used? *(Note to surveyor – Read the list and explain professions as necessary. Check as many responses as apply.)* Note to surveyor – For each service provider identified by the respondent, ask the respondent to estimate the number of times in the last year they used the service provider.

✓			Number of times in the last year the respondent used the health service provider.
5a. Doctor			
1 ☐ Yes	*2* ☐ No	General / Family Doctor	
1 ☐ Yes	*2* ☐ No	Specialist:(please specify)	
1 ☐ Yes	*2* ☐ No	Specialist:	
1 ☐ Yes	*2* ☐ No	Specialist:	
5b. Nurse			
1 ☐ Yes	*2* ☐ No	Nurse Practitioner	
1 ☐ Yes	*2* ☐ No	Registered Nurse	
1 ☐ Yes	*2* ☐ No	Public Health Nurse	
1 ☐ Yes	*2* ☐ No	Community Mental Health Nurse	
1 ☐ Yes	*2* ☐ No	Home Care Nurse	
1 ☐ Yes	*2* ☐ No	Licensed Practical Nurse	
1 ☐ Yes	*2* ☐ No	Personal Care Attendant	
1 ☐ Yes	*2* ☐ No	Other:(please specify)	
5c. Other health service professionals			
1 ☐ Yes	*2* ☐ No	Dentist	
1 ☐ Yes	*2* ☐ No	Optometrist (Eye Doctor)	
1 ☐ Yes	*2* ☐ No	Audiologist (Hearing professional)	
1 ☐ Yes	*2* ☐ No	Pharmacist	
1 ☐ Yes	*2* ☐ No	Physiotherapist	
1 ☐ Yes	*2* ☐ No	Chiropractor	
1 ☐ Yes	*2* ☐ No	Occupational Therapist	
1 ☐ Yes	*2* ☐ No	Massage Therapist	
1 ☐ Yes	*2* ☐ No	Occupational Health Officer	
1 ☐ Yes	*2* ☐ No	Speech Language Therapist	
1 ☐ Yes	*2* ☐ No	Psychologist	
1 ☐ Yes	*2* ☐ No	Dietitian	
1 ☐ Yes	*2* ☐ No	Child Management Specialist	
1 ☐ Yes	*2* ☐ No	Addictions Counselor	
1 ☐ Yes	*2* ☐ No	Midwife	
1 ☐ Yes	*2* ☐ No	Ambulance Attendant	
1 ☐ Yes	*2* ☐ No	Social Worker (child, youth, family)	
1 ☐ Yes	*2* ☐ No	Other: (please specify)	

6. Would you be open to going to another health service provider in your area if they provided similar types of services as your doctor? *(Note to surveyor – If the respondent does not have a regular doctor, refer to the most frequently used health service provider from question 5.)*

1 ☐ Yes *2* ☐ No *3* ☐ Unsure

7. In the last year has anything prevented you from using health care or social services in the area?

1 ☐ Yes *(go to question 8)* *2* ☐ No *(go to question 9)*

8. What types of things stopped you from using the health care and social services you needed?

1 ☐ Cost	*1* ☐ Yes	*2* ☐ No
2 ☐ Lack of health insurance	*1* ☐ Yes	*2* ☐ No
3 ☐ Too long for appointments	*1* ☐ Yes	*2* ☐ No
4 ☐ Weather	*1* ☐ Yes	*2* ☐ No
5 ☐ Lack of health professionals	*1* ☐ Yes	*2* ☐ No
6 ☐ Lack of transportation	*1* ☐ Yes	*2* ☐ No
7 ☐ Location of office	*1* ☐ Yes	*2* ☐ No
8 ☐ Too long in waiting room	*1* ☐ Yes	*2* ☐ No
9 ☐ Personal time available	*1* ☐ Yes	*2* ☐ No
10 ☐ Other (specify) _____	*1* ☐ Yes	*2* ☐ No

9. Are you involved in the Chronic Disease Management (CDM) Diabetes Collaborative as a patient?
(The diabetes collaborative is a new way of caring for diabetes through better communication, easier access to other services (e.g., dietician) and a team approach)

1 ☐ Yes *(go to question 10)* *2* ☐ No *(go to question 11)*

10. Based on your involvement with the Diabetes Collaborative, would you say your health is ...

Much worse today than before	Somewhat worse today than before	The same as before	Somewhat better today than before	Much better today than before
1	*2*	*3*	*4*	*5*

The next few questions relate to your most recent experience in accessing health services.

11. Using a scale of 1 to 5 where 1 is 'very difficult' and 5 is 'very easy', how easy was it for you to try and get the health services that you needed most recently?

Very Difficult	Somewhat difficult	Undecided	Somewhat easy	Very Easy
1	*2*	*3*	*4*	*5*

12. What did you do to try and get the health services that you needed?
For example, did you phone for an appointment or visit the hospital?

1 ☐ Phone	*1* ☐ Yes	*2* ☐ No
2 ☐ Visit clinic	*1* ☐ Yes	*2* ☐ No
3 ☐ Visit service provider office	*1* ☐ Yes	*2* ☐ No
4 ☐ Visit hospital	*1* ☐ Yes	*2* ☐ No
5 ☐ Pre-scheduled	*1* ☐ Yes	*2* ☐ No
6 ☐ Other (please specify) _____	*1* ☐ Yes	*2* ☐ No

13. Was this health service provider located in your area?

1 ☐ Yes *2* ☐ No

14. Was this the health service provider that you normally use?

1 ☐ Yes *2* ☐ No

15. How long did you have to wait to get an appointment with this health service provider?

Please specify the number of: ***Hours*** ☐ **Days** ☐ ***Weeks*** ☐

16. Did the service provider give you any information to help you to maintain your own health?

1 ☐ Yes *(go to question 17)* *2* ☐ No *(go to question 18)*

17. How helpful was the information that the provider gave you?

Was it... *1* ☐ Very helpful *2* ☐ Somewhat helpful *3* ☐ Not at all helpful

18. Using a scale of 1 to 5 where 1 is 'not satisfied at all' and 5 is 'very satisfied', how satisfied were you with the overall service that you most recently received from health providers in the region?

Not satisfied at all	Somewhat dissatisfied	Indifferent or no opinion	Somewhat satisfied	Very satisfied
1	*2*	*3*	*4*	*5*

19. Again on a scale of 1 to 5 where 1 is 'not involved at all ' and 5 is 'to a very great extent', how involved were you in any decisions made related to your treatment, services or health care? (e.g. Did you discuss your treatment with the provider? Did you have a say in further services or treatment?)

Not involved at all	To a little extent	To a moderate extent	To a great extent	To a very great extent
1	*2*	*3*	*4*	*5*

20. Do you feel that you are better able to **maintain** your own health today than you were one year ago?

1 ☐ Yes *2* ☐ No *3* ☐ Unsure

21. If there was a toll free number to receive health information from a health professional such as a nurse, would you use it?

1 ☐ Yes *2* ☐ No *3* ☐ Unsure

22. **During normal business hours** (i.e. 9:00 am to 5:00pm Monday to Friday), how long would it usually take you to travel from your home to the nearest health centre where you could see a health service provider?

Please specify the number of: ***Minutes*** ☐ ***Hours*** ☐ ***Days*** ☐

23. **Outside of normal business hours** (e.g. 10:00pm Thursday or Sunday afternoon), how long would it usually take you to travel from your home to the nearest health centre where you could see a health service provider?

Please specify the number of: **Minutes** ☐ ***Hours*** ☐ ***Days*** ☐

24. In the last year how many times have you gone to the Emergency Department of a hospital? ***Number of times =*** _____

25. Is there a road ambulance available in your community?

1 ☐ Yes *2* ☐ No *3* ☐ Unsure

26-29. **Using a scale of 1 to 5 where 1 = strongly disagree and 5 = strongly agree, please indicate the extent to which you disagree or agree with each of the following statements.**

26. In the last year I've noticed that my health service providers listen to my concerns more often.	*1*	*2*	*3*	*4*	*5*
27. In the last year I've noticed that my health service providers act upon my concerns more often.	*1*	*2*	*3*	*4*	*5*
28. In the last year I've noticed better coordination and communication between my health service providers.	*1*	*2*	*3*	*4*	*5*
29. In the last year I've noticed no change in the service provided by my health service providers.	*1*	*2*	*3*	*4*	*5*

For the last part of this survey I'd like to ask you a few questions about yourself. This information will help us describe the people who took part in the survey. Feel to skip any questions that you are uncomfortable answering.

30. What community do you live in? _____

31. What is your postal code? ☐☐☐ ☐☐☐

32. How many years have you lived in this community? ____

33. What year were you born in? *19*____

34. In your opinion, would you say your health is...

Very Poor	Poor	Fair	Good	Very Good	Excellent
1	*2*	*3*	*4*	*5*	*6*

35. What is the highest level of education that you completed? *(Check one response only)*

1 ☐ Less than high school
2 ☐ Secondary (high) school graduation
3 ☐ Some non-university trades certificate or diploma
4 ☐ Completed non-university trades certificate or diploma
5 ☐ Some university
6 ☐ Completed Bachelor's degree (e.g. B.A., B.Sc., B.S.W.)
7 ☐ Completed Master's or Doctoral degree (e.g. M.A., M.Sc., M.D., D.D.S, Ph.D.)

36. What is your current marital status?

1 ☐ Single - never married
2 ☐ Common law relationship
3 ☐ Separated
4 ☐ Married
5 ☐ Widowed
6 ☐ Divorced

37. Including yourself, how many adults live in this household? *(Defined as 18 years of age and over)* ____

38. How many children live in this household? *(Defined as 17 years of age and under)* ____

39. Considering all members of your household, what would you estimate the total yearly income to be? $_____

Note to surveyor - If the respondent declines to respond to this question, ask if he/she would feel more comfortable responding to an income range. If the respondent agrees, proceed with the following question...

Which one of the following income categories does your household fall into?

1 ☐ less than $10,000
2 ☐ between $10,000 and $19,999
3 ☐ between $20,000 and $29,999
4 ☐ between $30,000 and $39,999
5 ☐ between $40,000 and $49,999
6 ☐ between $50,000 and $59,999
7 ☐ between $60,000 and $69,999
8 ☐ between $70,000 and $79,999
9 ☐ between $80,000 and $89,999
10 ☐ between $90,000 and $99,999
11 ☐ $100,000 or more

40. Gender: ***1*** ☐ Male ***2*** ☐ Female *(Do not ask the respondent this question)*

41. Thinking about your most recent use of health services in the area, is there anything that the health service providers could have done to improve the experience for you? (Record actual comments)

42. Do you have any final comments that you would like to provide? (Record actual comments)

Thank you for participating in this survey.

***Record the interview finish time*: _____ 1 ☐am / 2 ☐pm**

APPENDIX O: DOCUMENT REVIEW DATA COLLECTION FORM

Item #	Description	Item Type*	Cost ($)	Comment
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

*Equipment (E) vs Human Resource (HR)

APPENDIX P: COVER LETTER, PRIMARY HEALTH CARE TEAM SURVEY

Memorial
University of Newfoundland

e-Health Research Unit
Level I, Room 1775, Telemedicine Centre
Faculty of Medicine
The Health Sciences Centre

[date]

Dear _____:

As you may be aware, the Connaigre Peninsula primary health care team area was chosen by the Office of Primary Health Care as a pilot site to explore the value of sharing client information in an interdisciplinary environment through the enhancement of information and communication capabilities. As such, a study is being conducted to evaluate the impact of enhanced health information systems capacity on team functioning, administrative functioning/workflow and quality of care in a rural primary health care setting.

Three primary health care team areas are included in this study, each with varying degrees of information and communication systems capacity: 1) Connaigre Peninsula; 2) Twillinagte/New World Island; and Bonne Bay. The study encompasses of a number of data collection strategies including surveys, key informant interviews, focus groups, document review and secondary data analysis.

As a primary health care provider in your primary health care area, your input is very important to the study. **At this time, we are inviting you to participate in the study by completing a survey.** Some questions ask you to compare your current experiences to your experiences before the primary health care initiative (approximately 2 years ago). Other questions relate to specific functions that are enabled through the use of technology.

There are two ways to complete the survey:

1) **Online survey – the survey can be completed online at the following address** http://www.med.mun.ca/surveys/survey.asp?s=01210243102019.

2) **Paper survey – the survey can be completed on paper and returned using the pre-addressed, stamped return envelope provided.**

Please complete only one or the other.

Participation in the study is voluntary. Your responses will be completely anonymous and all results will be reported in aggregate form only. If you have any questions or problems with the online survey, please contact Amy Caison at alcaison@mun.ca or Kayla Collins at kaylac@nlchi.nl.ca.

We would like to thank you in advance for your cooperation.

Sincerely,

Doreen Neville, ScD Kayla Collins, MSc

St. John's, NL Canada A1B 3V6 · Tel.: (709) 777-8837 · Fax: (709) 777-8838

APPENDIX Q: CONSENT FORM, FOCUS GROUP

Consent to Take Part in Research
Focus Group

Title: Evaluating the Impact of Enhanced Health Information Systems Capacity in Primary Health Care Settings in Newfoundland and Labrador

Study Team: Dr. Doreen Neville (Principal Investigator), Kayla Collins, Don MacDonald, Amy Caison

Sponsors: Office of Primary Health Care
Newfoundland and Labrador Centre for Health Information

You have been asked to take part in a research study. It is up to you to decide whether to be in the study or not. Before you decide, you need to understand what the study is for, what risks you might take and what benefits you might receive. This consent form explains the study.

The researchers will:

- Discuss the study with you
- Answer your questions
- Keep confidential any information which could identify you personally
- Be available during the study to deal with problems and answer questions

You may decide not to take part in or to leave the study at any time.

Introduction

This study will examine the impact of enhanced health information systems capacity a in primary health care setting in Newfoundland and Labrador.

Purpose

The purpose of the focus group is to gain a better understanding of the benefits of the information and communication system enhancements and to discuss what went well, what could have been improved and what gaps, if any, still exist.

Description of the study procedures

During the session, the research team will give you an overview of the study and a status update. A series of discussion questions will be posed to stimulate discussion and the session will be tape recorded. You may be asked to participate in other components of the study at a later date.

Length of time

You will be asked to give approximately 1 hour of your time to take part in the focus group discussion.

Possible risks and discomforts

There are no anticipated risks or discomforts associated with this study. However, the session will be tape recorded and participants will be asked to give freely of their time and provide honest feedback. You are not required to answer any question that you are not comfortable in answering.

Benefits

It is not known whether this study will benefit you personally.

Liability Statement

Signing this form gives us your consent to be in this study. It tells us that you understand the information about the research study. When you sign this form, you do not give up your legal rights. Researchers or agencies involved in this research study still have their legal and professional responsibilities.

Confidentiality

By signing this consent form, you will be giving your permission for the assessment of information that you give during your participation. However, your name will not appear in any report or article published as a result of this study. Your responses will be grouped with that of others and presented in general terms.

Questions

If you have any questions about taking part in this research, you can meet with the Principal Investigator who is in charge of the study at Memorial University of Newfoundland.

That person is:

Dr. Doreen Neville, (709) 777-6215, dneville@mun.ca

Or, you can talk to someone who is not involved with the study at all, but can advise you on your rights as a participant in a research study.

This person can be reached through:

Office of the Human Investigation Committee (HIC), (709) 777-6974, hic@mun.ca

Signature Page

Study Title: Evaluating the Impact of Enhanced Health Information Systems Capacity in Primary Health Care Settings in Newfoundland and Labrador

Principal Investigator: Dr. Doreen Neville

To be filled out and signed by the participant:

Please check as appropriate.

I have read the information sheet	Yes□ No□
I have had the opportunity to ask questions/to discuss this study	Yes□ No□
I have received satisfactory answers to all of my questions	Yes□ No□
I have received enough information about the study	Yes□ No□
I have spoken with a qualified member of the study team	Yes□ No□
I understand that I am free to withdraw from the study • At any time • Without having to give a reason	Yes□ No□
I understand that it is my choice to be in the study and I may not benefit	Yes□ No□
In agree to take part in this study	Yes□ No□

_____ _____

Signature of participant Date

_____ _____

Signature of witness Date

To be signed by the investigator:

I have explained this study to the best of my ability. I invited questions and gave answers. I believe that the participant fully understands what is involved in being in the study, any potential risks of the study and that he or she has freely chosen to be in the study.

_____ _____

Signature of investigator Date

APPENDIX R: INITIAL CONTACT LETTER, KEY INFORMANT INTERVIEWS, PHASE II

Dear Ms. _____,

I am assisting Kayla Collins and Dr. Doreen Neville with the Enhanced Information Systems in Primary Health Care evaluation study.

As part of the evaluation study, we are conducting interviews with staff representing various positions to gain their perspectives on the use of information/community technology in their work. I am contacting you at this time to ask for your participation in the study by participating in a short telephone interview. The interview will take about 20-30 minutes. Attached is a document that explains the study procedures in a little more detail.

We'd like to conduct the interviews during the week of [*date*]. If you agree to participate, please suggest a time (and a telephone number) when we may contact you. Once we have confirmed a time, I will send you the interview guide so that you can be better prepared to respond to the questions.

Regards,

[*Research Assistant*]

Title: Evaluating the Impact of Enhanced Information Systems Capacity in Primary Health Care in Newfoundland and Labrador

Principal Investigator: Dr. Doreen Neville

Sponsors: Office of Primary Health Care
Newfoundland and Labrador Centre for Health Information

You have been asked to take part in a research study. It is up to you to decide whether to be in the study or not. Before you decide, you need to understand what the study is for, what risks you might take and what benefits you might receive. This consent form explains the study.

The researchers will:

- Discuss the study with you
- Answer your questions
- Keep confidential any information which could identify you personally
- Be available during the study to deal with problems and answer questions

You may decide not to take part in, or leave the study, at any time.

Background

This study is designed to evaluate the impact of enhanced health information systems capacity on team functioning and health care delivery in a primary health care setting in Newfoundland and Labrador.

Purpose

The purpose of the interview is to determine the perceptions of the information and communication enhancement project among key individuals involved in this project.

Description of the Study Procedures

If you are willing to be interviewed, a research analyst will arrange a time for a telephone interview.

Length of Time

The interview will take approximately 1 hour to complete.

Possible Risks and Discomforts

There are no anticipated risks and discomforts associated with this study. However, participants will be asked to give freely of their time and will be asked to provide honest feedback.

Benefits

It is not known whether this study will benefit you personally.

Liability Statement

You will be contacted by the research analyst working on the study to ask for your participation in the study. If you verbally consent to participate in the study, this tells us that you understand the information about the research study. When you consent to participate, you do not give up your legal rights. Researchers or agencies involved in this research study still have their legal and professional responsibilities.

Confidentiality

By verbally agreeing to participate, you will be giving your permission for the assessment of information that you give during the interview. However, your name will not appear in any report or article published as a result of this study.

Questions

If you have any questions about taking part in this research, you can meet with, or contact, the Principal Investigator who is charge of this study at the Faculty of Medicine, Memorial University of Newfoundland. That person is:

Dr. Doreen Neville Phone: 777-6215 e-mail: DNeville@mun.ca.

Or you can talk to someone who is not involved with the study at all, but can advise you of your rights as a participant in a research study. This person can be reached through the:

Office of the Human Investigative Committee (HIC) at (709) 777-6974 (HIC@mun.ca)

Conflict of Interest Statement

Two co-investigators of this study are employees of the Newfoundland and Labrador Centre for Health Information and therefore may have a particular interest in the success of the study.

APPENDIX S: TELEPHONE SCRIPT #1, KEY INFORMANT INTERVIEWS, PHASE II

Hello Mr. /Ms. _____

This is _____ calling. I am working with Kayla Collins and Dr. Doreen Neville on a study in which we are evaluating the impact of enhanced information and communication systems capacity in a primary health care setting.

Approximately one week ago, you were sent a letter, via email, that describes the study as well as a document that outlines exactly what your participation in the study would entail. As you would have read in those documents, participation in the study is voluntary and confidentiality of all information is ensured.

I am calling now to ask for your participation in the study. This will involve participating in a telephone interview in which you will be asked a series of questions regarding the structure of the primary health care initiative with which you are involved with and the current technical environment. Are you willing to volunteer approximately 45 minutes of your time to participate in the study?

(If the individual agrees to participate) Shall we go ahead and schedule a time for the interview?

Scheduled interview date/time: _____

Thank you very much Mr./Ms. _____. You will be contacted by Mrs. Kayla Collins, a co-investigator on the study, on *(interview date/time)* at which time the interview will take place.

We look forward to speaking with you again.

APPENDIX T: TELEPHONE SCRIPT #2, KEY INFORMANT INTERVIEWS, PHASE I

Hello Mr. /Ms. _____

This is Kayla Collins calling. As _____ indicated I would, when he/she spoke with you previously, I am calling now to ask you a few questions regarding your perceptions of the information and communication enhancement project.

Before we begin, I want to let you know that _____ (*one other research team member)* is also present and that both of us will be taking notes during the interview.

Do you have any questions before we begin?

(see interview guides for questions to be asked)

(when interview is finished)
Thank you very much Mr./Ms. _____. Your participation and time is very much appreciated.

APPENDIX U: LETTER OF APPROVAL TO ACCESS DATA

GOVERNMENT OF
NEWFOUNDLAND AND LABRADOR

Department of
Health and Community Services
Office of Primary Health Care

October 14, 2005

Dr. Doreen Neville
Chair, e-Health Research Unit
Telemedicine Centre, Faculty of Medicine
Memorial University of Newfoundland
Health Sciences Complex, Room 1782
300 Prince Philip Drive, St. John's, NL A1B 1V6

Dear Dr. Neville:

In response to your letter dated October 12, 2005, access to data collected through the Primary Health Care Team Effectiveness/Scope of Practice survey and the Patient/Client survey, as well as budget information, is approved for the purposes of carrying out the evaluation of enhanced information systems capacity.

I look forward to reading your final report.

Sincerely,

Juanita Barrett
Team Leader
Office Primary Health Care

APPENDIX V: KNOWLEDGE TRANSFER PLAN

Knowledge Transfer Plan

Knowledge generated through this study may be used by:

- Department of Health and Community Services Executive, Office of Primary Health Care and health system managers to inform decisions related to the undertaking of similar projects in other primary health care team areas and throughout the province;
- Directors of IT and health IT project managers to identify lessons learned and key facilitators and barriers to success that may have implications for other health IT projects;
- Department of Health and Community Service Executive and the Centre for Health Information to provide support for the strategic directions of the province towards the development of an electronic health record;
- the Office of Primary Health Care and the project management team to show accountability for project investments;
- primary health care providers and other end users as evidence to support and champion the use of information technologies in support of high quality care;
- the project management team and key individuals from the intervention site involved in the needs assessment to identify further functionality gaps and generate disscusions around potential solutions; and
- researchers interested in information systems evaluation and primary health care, to build on in subsequent research in this area.

To increase the uptake of knowledge generated from the research and its use in planning and decision-making, key stakeholders including the project management team, the Office of Primary Health Care and Primary Health Care Coordinators in the three study sites were consulted and provided input into identifying the most appropriate dissimination methods. Dissimination tools that were identified include:

- a full length (25-30 page), plain-language report for the project management team and the Office of Primary Health Care;
- 15 minute PowerPoint presentations to the project management team, the Centre for Health Information, the Office of Primary Health Care, Department of Health and Community Services Executive and the provincial Primary Health Care Advisory Council, highlighting research implications;
- a 2-4 page, plain-language summary report, highlighting actionable messages, for PHC Coordinators, IT Directors and health IT project managers;
- 1-2 page, plain-language study summary for clinical decision makers, administrative support staff and local PHC Advisory Committees at the three study sites, as well as PHC team areas not involved in the study;
- a newsletter article in the Centre for Health Information's quarterly electronic newsletter and other newsletters as appropriate;
- magazines articles targeted at health system managers and administrators; and
- study wrap-up/feedback sessions. This mode of dissemination was suggested by PHC Coordinators based on feedback from the PHC team.

APPENDIX W: LETTERS OF APPROVAL, PHASE II

Memorial
University of Newfoundland

Office of Research and Graduate Studies (Medicine)
Faculty of Medicine
The Health Sciences Centre

November 17, 2005

Reference #05.222

Mrs. Kayla Collins
C/o Dr. Doreen Neville
e-health Research Unit
Faculty of Medicine

Dear Mrs. Collins:

Your application entitled "**Evaluating the impact of enhanced health information systems capacity in a rural primary health care setting in Newfoundland and Labrador**" was reviewed by a Sub-Committee of the Human Investigation Committee and **full approval** was granted.

This will be reported to the full Human Investigation Committee, for their information, at the meeting scheduled for **November 24, 2005**.

Full approval has been granted for one year. You will be contacted for annual update before **November 16, 2006**.

For a hospital-based study, it is **your responsibility to seek the necessary approval from the Health Care Corporation of St. John's and/or other hospital boards as appropriate**.

This Research Ethics Board (the HIC) has reviewed and approved the application for the study which is to be conducted by you as the qualified investigator named above at the specified study site. This approval and the views of this Research Ethics Board have been documented in writing. In addition, please be advised that the Human Investigation Committee currently operates according to the Tri-Council Policy Statement and applicable laws and regulations.

Notwithstanding the approval of the HIC, the primary responsibility for the ethical conduct of the investigation remains with you.

We wish you success with your study.

Sincerely,

John D. Harnett, MD, FRCPC
Co-Chair
Human Investigation Committee
Committee

Richard S. Neuman, PhD
Co-Chair
Human Investigation

JDH;RSN\jd

C Dr. C. Loomis, Vice-President (Research), MUN
Mr. W. Miller, Director of Planning & Research, HCCSJ

St. John's, NL Canada A1B 3V6 • Tel.: (709) 777-6762 • Fax: (709) 777-7501 • email: rgs@mun.ca

Memorial
University of Newfoundland

Office of Research and Graduate Studies (Medicine)
Faculty of Medicine
The Health Sciences Centre

May 19, 2006

Reference #05.222

Mrs. Kayla Collins
C/o Dr. Doreen Neville
e-health Research Unit
Faculty of Medicine

Dear Mrs. Collins:

This will acknowledge the completed amendment form, dated May 18, 2006 wherein you provide an amendment, cover letter and revised survey, for your research study entitled **"Evaluating the impact of enhanced health information systems capacity in a rural primary health care setting in Newfoundland and Labrador**.

The Chairs of the Human Investigation Committee reviewed your correspondence, approved the amendment, cover letter and revised survey, as submitted. This will be reported to the full Human Investigation Committee for their information at the meeting scheduled for **May 25, 2006.**

This Research Ethics Board (the HIC) has reviewed the amendment for the study which is to be conducted by you as the qualified investigator named above at the specified study site. This approval and the views of this Research Ethics Board have been documented in writing. In addition, please be advised that the Human Investigation Committee currently operates according to the Tri-Council Policy Statement and applicable laws and regulations.

Sincerely,

Richard Neuman, PhD
Co-Chair
Human Investigation Committee

John Harnett, MD, FRCPC
Co-Chair
Human Investigation Committee

RN/JH/jd

c Dr. C. Loomis, Vice-President (Research), MUN
Mr. Wayne Miller, Director of Planning & Research, HCCSJ

St. John's, NL, Canada A1B 3V6 • Tel: (709) 777-6762 • Fax: (709) 777-7501 • email: rgs@mun.ca

Memorial
University of Newfoundland

Human Investigation Committee
Research and Graduate Studies
Faculty of Medicine
The Health Sciences Centre

June 29, 2006

Reference #05.222

Mrs. Kayla Collins
C/o Dr. Doreen Neville
E-health Research Unit
Faculty of Medicine

Dear Mrs. Collins:

This will acknowledge your email correspondence dated June 24, 2006 wherein you provide a revised survey, for your research study entitled **"Evaluating the impact of enhanced health information systems capacity in a rural primary health care setting in Newfoundland and Labrador.**

The Chairs of the Human Investigation Committee reviewed your correspondence, approved the revised survey, as submitted. This will be reported to the full Human Investigation Committee for their information at the meeting scheduled for **July 6, 2006.**

Please be advised that the Human Investigation Committee currently operates according to the Good Clinical Practice Guidelines, the Tri-Council Policy Statement and applicable laws and regulations.

Sincerely,

Richard Neuman, PhD
Co-Chair
Human Investigation Committee

John Harnett, MD, FRCPC
Co-Chair
Human Investigation Committee

RN;JH\jd

C Dr. C. Loomis, Vice-President (Research), MUN
Mr. W. Miller, Director of Planning & Research, HCCSJ

St. John's, NL, Canada A1B 3V6 • Tel: (709) 777-6974 • Fax: (709) 777-8776 • email: hic@mun.ca • www.med.mun.ca/hic

Memorial
University of Newfoundland

Human Investigation Committee
Research and Graduate Studies
Faculty of Medicine
The Health Sciences Centre

July 5, 2006

Reference #05.222

Mrs. Kayla Collins
C/o Dr. Doreen Neville
e-health Research Unit
Faculty of Medicine

Dear Mrs. Collins:

This will acknowledge the completed amendment form, dated June 30, 2006 wherein you provide amendment and revised consent form, for your research study entitled **"Evaluating the impact of enhanced health information systems capacity in a rural primary health care setting in Newfoundland and Labrador**.

The Chairs of the Human Investigation Committee reviewed your correspondence, approved the amendment and revised consent form, as submitted. This will be reported to the full Human Investigation Committee, for their information, at the meeting scheduled for **July 20, 2006.**

This Research Ethics Board (the HIC) has reviewed the amendment for the study which is to be conducted by you as the qualified investigator named above at the specified study site. This appr and the views of this Research Ethics Board have been documented in writing. In addition, please advised that the Human Investigation Committee currently operates according to the Tri-Council Policy Statement and applicable laws and regulations.

Sincerely,

Richard Neuman, PhD
Co-Chair
Human Investigation Committee

John Harnett, MD, FRCPC
Co-Chair
Human Investigation Committee

RN;JH\jd

C Dr. C. Loomis, Vice-President (Research), MUN
Mr. W. Miller, Director of Planning & Research, HCCSJ

St. John's, NL, Canada A1B 3V6 • Tel.: (709) 777-6974 • Fax: (709) 777-8776 • email: hic@mun.ca • www.med.mun.ca

Memorial
University of Newfoundland

Human Investigation Committee
Research and Graduate Studies
Faculty of Medicine
The Health Sciences Centre

August 4, 2006

Reference #05.203

Dr. D. Neville
Community Health
Faculty of Medicine
2nd Floor, Health Sciences Centre

Dear Dr. Neville:

This will acknowledge the completed amendment form, dated July 20, 2006 wherein you provide an amendment and a copy of Community Health Providers Interview Guide, for your research study entitled **"Evaluating the impact of enhanced health information systems capacity in primary health care settings in Newfoundland and Labrador"**.

The Chairs of the Human Investigation Committee reviewed your correspondence, approved the amendment and the Community Health Providers Interview Guide, as submitted. This will be reported to the full Human Investigation Committee for their information at the meeting scheduled for **August 17, 2006.**

This Research Ethics Board (the HIC) has reviewed the amendment for the study which is to be conducted by you as the qualified investigator named above at the specified study site. This approval and the views of this Research Ethics Board have been documented in writing. In addition, please be advised that the Human Investigation Committee currently operates according to the Tri-Council Policy Statement and applicable laws and regulations.

Sincerely,

Richard Neuman, PhD
Co-Chair
Human Investigation Committee

John Harnett, MD, FRCPC
Co-Chair
Human Investigation Committee

RN/JH\jd

C Dr. C. Loomis, Vice-President (Research), MUN
Mr. W. Miller, Director of Planning & Research, HCCSJ
Ms. Kayla Collins, Community Health
Ms. Marian Elliott, Tetra

St. John's, NL, Canada A1B 3V6 • Tel.: (709) 777-6974 • Fax: (709) 777-8776 • email: hic@mun.ca • www.med.mun.ca/hic

APPENDIX X: RESULTS OF STATISTICAL SIGNIFICANCE TESTS

Primary Health Care Team Survey

Table 8. Team Functioning, Comparison Between Sites, Percent Agree

STATEMENT	BONNE BAY – CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
	BB		CP		p	CP		T/NWI		p
	%	n	%	n		%	n	%	n	
Communication with other providers within my PHC team has improved	43.8	16	63.3	30	0.202	63.3	30	60.0	25	0.800
Communication with other providers outside my PHC team has improved	31.3	16	43.3	30	0.424	43.3	30	45.8	24	0.854
Coordination of client care with providers within my PHC Team has improved	40.0	15	60.0	30	0.205	60.0	30	58.3	24	0.901
Coordination of client care with providers outside my PHC Team has improved	40.0	15	51.7	29	0.460	51.7	29	45.8	24	0.669
Referral documents (that you compile and/or receive) are more complete	11.1	9	29.6	27	0.396	29.6	27	38.1	21	0.537
I have more information about my clients' visits to providers within my PHC Team	20.0	10	25.9	27	1.000	25.9	27	52.4	21	0.060
I have more information about my clients' visits to providers outside my PHC Team	40.0	10	18.5	27	0.215	18.5	27	35.0	20	0.200

Note: Some respondents did not complete all survey items; 'n' indicates the total number of respondents for each item.

Table 9. Quality of Care, Comparison Between Sites, Percent Agree

STATEMENT	BONNE BAY – CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
	BB		CP		p	CP		T/NWI		p
	%	n	%	n		%	n	%	n	
I have more information on individual clients	33.3	9	60.0	30	0.255	60.0	30	45.5	22	0.299
I have more information on the population to which I deliver care as a whole	25.0	16	34.4	29	0.511	34.4	29	38.1	21	0.793
I have a more complete client chart	22.2	9	39.3	28	0.446	39.3	28	40.9	22	0.907
The timeliness of referrals has improved	11.1	9	41.3	29	0.126	41.3	29	40.0	20	0.923
I have all information about my clients that is important to their care	20.0	10	48.3	29	0.152	48.3	29	30.4	23	0.193
Clients seem more satisfied with the care they receive	20.0	10	30.0	30	0.696	30.0	30	50.0	22	0.143
I am better able to make decisions about client care	20.0	10	50.0	30	0.145	50.0	30	36.4	22	0.328
Patient/client safety has improved	9.1	11	43.3	30	0.064	43.3	30	37.5	24	0.665
I am able to act on test results in a more timely fashion	10.0	10	57.7	26	0.022	57.7	26	35.0	20	0.127
The quality of client-provider interactions has improved	22.2	9	41.4	29	0.438	41.4	29	50.0	22	0.540
In-office/clinic wait time has decreased	11.1	9	28.6	28	0.403	28.6	28	27.8	18	0.953
I am better able to adhere to clinical practice guidelines	10.0	10	59.3	27	0.010	59.3	27	38.1	21	0.146

Note: Some respondents did not complete all survey items; 'n' indicates the total number of respondents for each item.

Table 10. Administrative Functioning, Comparison Between Sites, Percent Agree

STATEMENT	BONNE BAY – CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
	BB		CP		p	CP		T/NWI		p
	%	n	%	n		%	n	%	n	
The quality of my workday has improved	12.5	16	40.0	30	0.092	40.0	30	34.8	23	0.698
I see more clients per day	0.0	9	24.1	29	0.164	24.1	29	50.0	18	0.069
I spend less time locating client information	10.0	10	50.0	30	0.032	50.0	30	34.8	23	0.268
I have less unfinished work at the end of the workday	6.7	15	46.4	28	0.015	46.4	28	39.1	23	0.601
There is less duplication of testing	0.0	10	55.6	27	0.002	55.6	27	26.3	19	0.049
The security of client information has improved	10.0	10	46.4	28	0.059	46.4	28	40.9	22	0.696
There is less duplication of data collection	0.0	12	23.3	30	0.164	23.3	30	36.4	22	0.306
I save time on specific tasks throughout the day	10.0	10	29.6	27	0.393	29.6	27	27.3	22	0.856
I spend more time on specific tasks throughout the day	10.0	10	32.1	28	0.236	32.1	28	40.9	22	0.522

Note: Some respondents did not complete all survey items; 'n' indicates the total number of respondents for each item.

Table 11. User Satisfaction and Perceived Impact, Charting, Comparison Between Sites, Number of Respondents who Agree

AREA	STATEMENT	BONNE BAY - CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
		BB		CP		p	CP		T/NWI		p
		x	n	x	n		x	n	x	n	
Satisfaction	Training sufficient	1	4	7	16	0.619	7	16	11	17	0.227
	Technical support adequate	1	4	10	16	0.285	10	16	10	17	0.829
	System performance adequate	0	0	10	16	0.087	10	16	9	17	0.579
	System downtime acceptable	0	4	10	16	0.087	10	16	9	16	0.719
	System downtime non-disruptive	0	4	5	15	0.530	5	15	7	16	0.552
	Easy to use	0	4	12	16	0.014	12	16	13	17	1.000
	Adequate access	2	4	14	16	0.162	14	16	11	17	0.225
	Meets needs	0	4	10	15	0.033	10	15	13	17	0.699
	Would return to old way of working	2	4	6	15	1.000	6	15	2	17	0.106
Positive Impact	Team functioning	0	0	11	16	0.058	11	16	12	17	1.000
	Coordination of care	1	3	11	16	0.523	11	16	11	17	0.805
	Administrative functioning/workflow	1	3	11	16	0.523	11	16	10	15	1.000

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

Table 12. User Satisfaction and Perceived Impact, Scheduling, Comparison Between Sites, Number of Respondents who Agree

AREA	STATEMENT	BONNE BAY - CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
		BB		CP		p	CP		T/NWI		p
		x	n	x	n		x	n	x	n	
Satisfaction	Training sufficient	1	1	2	5	1.000	2	5	x	n	0.222
	Technical support adequate	1	1	3	5	1.000	3	5	6	7	0.523
	System performance adequate	1	1	2	5	1.000	2	5	6	7	0.558
	System downtime acceptable	0	1	1	5	1.000	1	5	5	7	0.293
	System downtime non-disruptive	0	1	1	4	1.000	1	4	4	7	1.000
	Easy to use	1	1	3	5	1.000	3	5	1	7	0.152
	Adequate access	1	1	4	5	1.000	4	5	7	7	0.417
	Meets needs	1	1	3	5	1.000	3	5	7	7	0.182
	Would return to old way of working	0	1	0	5	1.000	0	5	6	6	0.455
Positive Impact	Team functioning	1	1	3	5	1.000	3	5	2	6	0.182
	Coordination of care	1	1	4	5	1.000	4	5	6	6	1.000
	Administrative functioning/workflow	1	1	4	5	1.000	4	5	4	6	0.455

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

Table 13. User Satisfaction and Perceived Impact, Registration/Search and Define, Comparison Between Sites, Number of Respondents who Agree

AREA	STATEMENT	BONNE BAY - CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
		BB		CP		p	CP		T/NWI		p
		x	n	x	n		x	n	x	n	
Satisfaction	Training sufficient	1	2	11	15	0.515	11	15	9	13	1.000
	Technical support adequate	2	2	12	16	1.000	12	16	10	13	1.000
	System performance adequate	1	2	9	16	1.000	9	16	10	13	0.433
	System downtime acceptable	1	2	6	16	1.000	6	16	9	13	0.089
	System downtime non-disruptive	1	2	4	15	0.515	4	15	6	13	0.433
	Easy to use	1	2	12	16	0.490	12	16	9	14	0.694
	Adequate access	2	2	14	16	1.000	14	16	10	14	0.378
	Meets needs	1	2	10	15	1.000	10	15	10	14	1.000
	Would return to old way of working	0	2	2	15	1.000	2	15	3	14	0.651
Positive Impact	Team functioning	1	2	12	16	0.490	12	16	10	14	1.000
	Coordination of care	2	2	13	16	1.000	13	16	12	14	1.000
	Administrative functioning/workflow	2	2	12	16	1.000	12	16	11	12	0.355

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

Table 14. User Satisfaction and Perceived Impact, Laboratory Results Look-up, Comparison Between Sites, Number of Respondents who Agree

AREA	STATEMENT	BONNE BAY - CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
		BB		CP		p	CP		T/NWI		p
		x	n	x	n		x	n	x	n	
Satisfaction	Training sufficient	1	2	16	22	0.507	16	22	13	17	1.000
	Technical support adequate	1	2	17	23	0.490	17	23	15	17	0.428
	System performance adequate	1	2	19	23	0.367	19	23	15	17	1.000
	System downtime acceptable	1	2	12	22	1.000	12	22	11	16	0.376
	System downtime non-disruptive	1	1	11	22	1.000	11	22	9	16	0.703
	Easy to use	1	2	20	23	0.300	20	23	16	17	0.624
	Adequate access	1	2	21	23	0.230	21	23	16	17	1.000
	Meets needs	1	2	20	23	0.300	20	23	15	17	1.000
	Would return to old way of working	0	2	2	23	1.000	2	23	3	16	0.631
Positive Impact	Team functioning	2	2	22	23	1.000	22	23	15	17	0.565
	Coordination of care	2	2	22	23	1.000	22	23	16	17	1.000
	Administrative functioning/workflow	1	1	21	23	1.000	21	23	12	15	0.365

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

Table 15. User Satisfaction and Perceived Impact, Digital Imaging Look-up, Comparison Between Sites, Number of Respondents who Agree

AREA	STATEMENT	BONNE BAY - CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
		BB		CP		p	CP		T/NWI		p
		x	n	x	n		x	n	x	n	
Satisfaction	Training sufficient	0	2	2	3	0.400	2	3	5	7	1.000
	Technical support adequate	0	2	2	3	0.400	2	3	7	7	0.300
	System performance adequate	1	2	3	3	0.400	3	3	7	7	1.000
	System downtime acceptable	1	2	3	3	0.400	3	3	6	7	1.000
	System downtime non-disruptive	1	2	1	3	1.000	1	3	5	7	0.500
	Easy to use	1	2	3	3	0.400	3	3	5	7	1.000
	Adequate access	1	2	2	3	1.000	2	3	7	7	0.300
	Meets needs	1	2	3	3	0.400	3	3	7	7	1.000
	Would return to old way of working	1	2	0	3	0.400	0	3	1	7	1.000
Positive Impact	Team functioning	1	2	3	3	0.400	3	3	7	7	1.000
	Coordination of care	1	2	3	3	0.400	3	3	7	7	1.000
	Administrative functioning/workflow	0	1	3	3	0.250	3	3	6	6	1.000

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

Table 16. User Satisfaction and Perceived Impact, Messaging, Comparison Between Sites, Percent Agree

AREA	STATEMENT	BONNE BAY - CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
		BB		CP		p	CP		T/NWI		p
		%	n	%	n		%	n	%	n	
Satisfaction	Training sufficient	36.4	11	62.5	24	0.150	62.5	24	77.8	27	0.232
	Technical support adequate	50.0	12	75.0	24	0.157	75.0	24	75.0	28	1.000
	System performance adequate	66.7	12	76.0	25	0.696	76.0	25	78.6	28	0.823
	System downtime acceptable	58.3	12	52.0	25	0.717	52.0	25	51.9	27	0.991
	System downtime non-disruptive	58.3	12	50.0	24	0.637	50.0	24	51.9	27	0.895
	Easy to use	58.3	12	88.0	25	0.083	88.0	25	92.9	28	0.658
	Adequate access	83.3	12	88.0	25	1.000	88.0	25	82.1	28	0.708
	Meets needs	75.0	12	76.0	25	1.000	76.0	25	89.3	28	0.278
	Would return to old way of working	0	9	8.7	23	1.000	8.7	23	22.2	27	0.261
Positive Impact	Team functioning	75.0	12	84.0	25	0.659	84.0	25	85.2	27	1.000
	Coordination of care	55.6	9	80.0	25	0.201	80.0	25	88.5	26	0.465
	Administrative functioning/workflow	50.0	10	69.6	23	0.433	69.6	23	85.2	27	0.184

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

Table 17. User Satisfaction and Perceived Impact, Videoconferencing, Comparison Between Sites, Percent Number of Respondents who Agree

AREA	STATEMENT	BONNE BAY - CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
		BB		CP		p	CP		T/NWI		p
		x	n	x	n		x	n	x	n	
Satisfaction	Training sufficient	0	7	1	12	1.000	1	12	3	16	0.613
	Technical support adequate	1	7	4	12	0.603	4	12	6	18	1.000
	System performance adequate	1	7	5	11	0.316	5	11	7	19	0.712
	System downtime acceptable	1	4	4	10	1.000	4	10	7	18	1.000
	System downtime non-disruptive	0	4	4	10	0.251	4	10	7	18	1.000
	Easy to use	0	6	4	11	0.237	4	11	7	18	1.000
	Adequate access	0	7	7	11	0.013	7	11	9	18	0.702
	Meets needs	0	5	5	11	0.119	5	11	10	18	0.710
	Would return to old way of working	1	6	2	10	1.000	2	10	7	19	0.431
Positive Impact	Team functioning	1	5	9	11	0.036	9	11	11	19	0.246
	Coordination of care	0	3	9	11	0.027	9	11	10	18	0.234
	Administrative functioning/workflow	0	5	7	11	0.034	7	11	7	15	0.453

Note: Some individuals did not respond to all survey items; 'x' indicates number of respondents who agree and 'n' indicates the total number of respondents for each item.

Team Effectiveness/Scope of Practice Survey

Table 21. Communication and Information Exchange, Comparison Between Sites, Percent Agree

STATEMENT		BONNE BAY – CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
		BB		CP		p	CP		T/NWI		p
		%	n	%	n		%	n	%	n	
Communication between scheduled meetings is effective	T1	70.0	10	35.3	34	0.074	35.3	34	54.2	24	0.153
	T2	54.5	11	63.0	27	0.722	63.0	27	58.3	36	0.710
Relevant information is exchanged among team members	T1	80.0	10	47.1	34	0.083	47.1	34	55.6	27	0.510
	T2	69.2	13	57.1	28	0.460	57.1	28	55.6	36	0.899
Relevant information is exchanged in a timely fashion	T1	70.0	10	41.2	34	0.155	41.2	34	46.2	26	0.700
	T2	69.2	13	64.3	28	1.000	64.3	28	54.3	34	0.423
There is limited duplication of communication within our team	T1	60.0	10	39.4	33	0.295	39.4	33	50.0	26	0.415
	T2	75.0	12	55.6	27	0.305	55.6	27	50.0	34	0.666
Our team members are open and honest when communicating	T1	80.0	10	54.5	33	0.269	54.5	33	55.6	27	0.938
	T2	84.6	13	71.4	28	0.458	71.4	28	58.3	36	0.279
We effectively use technology to maximize team communications	T1	60.0	10	45.7	35	0.491	45.7	35	77.8	27	0.011
	T2	46.2	13	67.9	28	0.185	67.9	28	68.6	35	0.952

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

Table 22. Coordination of Care, Comparison Between Sites, Percent Agree

STATEMENT		BONNE BAY – CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
		BB		CP		p	CP		T/NWI		p
		%	n	%	n		%	n	%	n	
Our team does ***not*** effectively involve network providers	T1	15.4	13	23.5	34	0.703	23.5	34	24.1	29	0.955
	T2	23.1	13	3.6	28	0.086	3.6	28	16.2	37	0.130
We use common client/patient records/charts where possible	T1	11.1	9	58.3	36	0.022	58.3	36	51.7	29	0.594
	T2	40.0	10	74.1	27	0.118	74.1	27	53.1	32	0.594
Working as a team has resulted in service delivery being more integrated and coordinated	T1	37.5	8	52.8	36	0.698	52.8	36	51.7	29	0.933
	T2	46.2	13	64.3	28	0.273	64.3	28	55.6	36	0.481
Overall, I am satisfied with the level of coordination between team members and network providers	T1	40.0	10	47.4	38	0.735	47.4	38	45.2	31	0.855
	T2	38.5	13	71.4	28	0.044	71.4	28	59.5	37	0.318

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

Table 23. Scope of Practice, Comparison Between Sites, Percent Agree

STATEMENT		BONNE BAY – CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
		BB		CP		p	CP		T/NWI		p
		%	n	%	n		%	n	%	n	
Service is being delivered through appropriate providers	T1	40.0	10	52.9	34	0.472	52.9	34	31.0	29	0.080
	T2	38.5	13	64.3	28	0.121	64.3	28	41.7	36	0.072
Team-based functions are shared across professional boundaries	T1	50.0	10	44.4	36	1.000	44.4	36	50.0	28	0.659
	T2	41.7	12	71.4	28)	0.091	71.4	28)	41.2	34	0.017
Other professionals in my practice setting utilize my professional expertise for a range of tasks	T1	58.3	12	67.6	37	0.729	67.6	37	60.0	30	0.521
	T2	58.3	12	59.3	27	1.000	59.3	27	45.7	35	0.290
My scope of practice is being fully utilized within my practice setting	T1	41.7	12	47.2	36	0.738	47.2	36	53.3	30	0.621
	T2	50.0	10	67.9	28	0.449	67.9	28	42.9	35	0.048

Note: Some respondents did not complete all survey site.

Table 24. General Team Functioning, Comparison Between Sites, Percent Agree

STATEMENT		BONNE BAY – CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
		BB		CP		p	CP		T/NWI		p
		%	n	%	n		%	n	%	n	
Overall, I'm satisfied with the functioning of my Primary Health Care Team	T1	77.8	9	64.7	34	0.693	64.7	34	59.3	27	0.663
	T2	53.8	13	64.3	28	0.524	64.3	28	51.4	35	0.306
I would encourage other health care service providers to work in this practice setting	T1	60.0	10	51.4	35	0.729	51.4	35	46.4	28	0.693
	T2	38.5	13	60.7	28	0.184	60.7	28	62.9	35	0.862

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

Table 26. Satisfaction with Overall Service, Comparison Between Sites, Percent Satisfied

TIME PERIOD	BONNE BAY – CONNAIGRE PENINSULA					CONNAIGRE PENINSULA - TWILLINGATE/NWI				
	BB		CP		p	CP		T/NWI		p
	%	n	%	n		%	n	%	n	
T1	83.0	300	85.6	354	0.362	85.6	354	90.5	388	0.040
T2	89.7	350	88.6	351	0.636	88.6	351	96.1	355	0.000

Note: Some individuals did not respond to all survey items; 'n' indicates the total number of respondents for each item.

APPENDIX Y: EXPECTED AND ACTUAL COSTS

Expected Costs, Itemized by Equipment versus Human Resource Costs

Item		Cost Distribution ($ CAD)		Total ($ CAD)
		Equipment	Human Resources	
Institutional/ Meditech	Clinical Information Specialist		14,000	97,500
	PC (4)	6,000		
	Label printer	2,000		
	Wireless LAN	20,000		
	Mobile carts (4)	20,000		
	Wireless POC Devices	15,000		
	Medinet Interfaces	17,500		
	Laboratory resource person		3,000	
Community Health/ CRMS	Tablet PC (10)	40,000		67,000
	Communication costs 4 months	4,000		
Total		**124,500**	**17,000**	**144,500**

Actual Costs, Itemized by Equipment versus Human Resource Costs

Item		Cost Distribution ($ CAD)		Total ($ CAD)
		Equipment	Human Resources	
Institutional/ Meditech	Clinical Information Specialist		14,000	111,954. 63
	PCs (8)/LCD monitor	10,085.89		
	Label printer	1,490.53		
	Wireless LAN	13,526.46		
	Mobile carts (4)	13,567.95		
	Wireless POC Devices	9,465.19		
	Medinet Interfaces	21,360.50		
	Laboratory resource person		3,000	
	Community Wide Scheduling LIVE fee	781.18		
	Dictaphone	24,676.93		
Community Health/ CRMS	Tablet PC (7)	19,216.31		19,216.31
Total		**1141,70.94**	**17,000**	**131,170.94**